

R/C HELI MINI-REVIEW: GMP LEGEND

August 1989

48120

MODEL

Canada \$3.75

AIRPLANE

THE WORLD'S PREMIER R/C MODELING MAGAZINE

NEWS

\$2.95

TOP GUN
R/C SCALE SHOOTOUT

BUILD THE
ELECTRIC HOTS

F151 MUSTANG
BIG MODEL OR
SMALL AIRPLANE?

FGM
MIRAGE 550
ELECTRIC

NEW
R/C HELICOPTER
SECTION

HOW TO: ENGINE
DRILL JIG



MODEL AIRPLANE

FEATURES

32 5151 Mustang
by Budd Davisson

41 Top Gun
Extravaganza
by Rich Uravitch

56 Kyosho Cessna
177 Cardinal
by John Lupperger
A Field & Bench Review

62 Dynaflyte Fun-
Scale Mustang 60
by Reed Kalisher
A Field & Bench Review

71 Carl Goldberg
Models Mirage
550
by Randy Randolph
A Field & Bench Review

96 Wildcats Air
Show
by Tom Meehan

102 Florio Nifty 50
by Ralph Cloud
A Field & Bench Review

CONSTRUCTION

20 'Lectric Hots
by Tom Stryker

HELICOPTER SECTION

66 GMP Legend Mini
Review
by Tim Diperi

80 Webra Speed
.50 Heli
by Mike Billinton

84 Heli Quick-Look:
Miniature Air-
craft QuickSilver
by Paul Tradelius



86 Graphical Radio
Set-Up Method
by Ron Farkas

89 Rotary-Wing
Roundup

91 Helicopter Chal-
lenge
by Craig Hath

COLUMNS

26 Fifty Years Ago
by Katherine Tolliver

28 Basics of Radio
Control
by Randy Randolph

38 How To: Make a
Drill Jig
by Randy Randolph

50 Jet Blast
by Rich Uravitch

52 Giant Steps
by Dick Phillips

66 Small Steps
by Joe Wagner

68 Sporty Scale
Techniques
by Frank Tiano

107 Pattern Matters
by Mike Lee

111 Four-Stroke
Forum
by Chris Abate

114 Golden Age of
R/C
by Hal deBolt

116 Quiet Flight
by John Lupperger

DEPARTMENTS

6 Editorial

8 Airwaves

14 Hints & Kinks
by Jim Newman

100 Product News

120 Plans Mart

122 Name the
Plane Contest

123 Club of the
Month

138 Ad Index

ON THE COVER: If the question were ever asked whether a direct link could be established between model airplanes and man-carrying versions, one would have to consider the Loehle 5151 as filling the bill. Even its construction and the materials used are familiar to virtually every hobbyist who has been building models for a while. Budd Davisson captures the essence both on Kodachrome and in his report in this issue. Heli flier Tim Diperi watches over his inverted GMP Legend after preparing a mini-review of this new kit for our Heli Section. Photos by Budd Davisson and Tim Diperi.

Editorial

by RICH URAVITCH



ONE OF THE REALLY enjoyable aspects of this job is reading the mail we receive from readers. Much of it is complimentary, and we naturally enjoy this the most; some of it takes us to task for one thing or another; but *all* of it has something to say. Many of the questions we use in "Airwaves" require a lot of research and delving into the Air Age archives to find the answer. Much of this important task is accomplished by Kyra and Barbara, who are members of our staff. However, when time permits, I personally venture into the catacombs, letters in hand, seeking the meaning of life (the modeling side, anyway)—or at least the answers! This frequently has me thumbing through back issues of *MAN*, pausing from time to time as I try to recall the very first time I read a specific article. Depending on the year, I can still pretty accurately tie issues to events, or at least to periods in my life. I recall doing many of the things you now do: reading the issue, deciding I just *had* to build the construction feature presented that month, sending for the plans, collecting the materials and starting to build. That cycle still continues today. There are lots of new faces now, though, but some of those who were my modeling heroes during my teen years are still around: Hal deBolt, George Aldrich, Bill Effinger, Don McGovern, Claude McCullough, Maxey Hester and others.

Know what *really* concerns me? As I wander through some of these old issues, pages yellowed and made frail by time, I wonder if any of today's modelers will be regarded as "heroes" years from now? Is the quest for faster, "better" and higher tech capable of accommodating individual recognition, or is the realization of that quest itself the objective?

I don't really know, but it's troublesome that I can easily remember the dates when Lindbergh flew the Atlantic and JFK was assassinated, but I have to consult the reference material to know when Neil Armstrong set foot on the moon or when the Challenger tragedy occurred. We have a tendency to take a lot for granted today; I sure hope we aren't approaching the time when there are no more heroes.

Rich

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

Group Publisher
LOUIS V. DeFRANCESCO, JR.

Publisher
DR. LOUIS V. DeFRANCESCO

Associate Publisher
YVONNE M. MICIK

Editor-in-Chief
RICH URAVITCH

Associate Editor
CHRIS CHIANELLI

Copy Editors
LYNNE SEWELL
KATHERINE TOLLIVER
LI AGEN

Art Direction
ALAN J. PALERMO

Assistant Art Director
MARY LOU RAMOS

Art Assistants
MICHAEL MAKUCEVICH
SARA CLARKE
MAC IIS

Word Processing
JACKIE MOSIER

Systems Manager
ED SCHENK

Advertising Sales
JASON STEIN

Advertising Sales Coordinator
JULIA KEISMAN

Advertising Traffic Manager
CHRISTINA FURORE

Circulation Manager
KATHLEEN RHODES

Advertising Production Manager
PENNY CURCIO

SUBSCRIPTION PRICES:

U.S. & Possessions (including APO & FPO): 1 year \$25.00;
2 years \$47.00; 3 years \$65.00. Outside U.S.: 1 year \$35.00;
2 years \$67.00; 3 years \$89.00. Payment must be in U.S.
funds.

MODEL AIRPLANE NEWS (ISSN No. 0026-7295) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897. Phone 203-834-2900. FAX: 203-762-9803. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. Micik, Treasurer. Second Class Postage Permit paid at Wilton, Connecticut, and additional Mailing Offices. Copyright 1989 by Air Age, Inc. All rights reserved.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made in writing with the Publisher. The Publisher assumes no responsibility for unsolicited material. Only manuscripts and supporting material accompanied by a SASE will be returned.

ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to *Model Airplane News*, Advertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Phone: 203-834-2900. FAX: 203-762-9803.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to *Model Airplane News*, Subscription Dept., P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

Airwaves

WHERE TO WRITE TO US

If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" *Model Airplane News*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.



Bird Dogging the Bird Dog

I've been a model builder for years, especially when control-line flying was popu-

lar. Recently, I've re-entered the model airplane sport as an R/C enthusiast. I'd like to construct an R/C model of the Cessna L-19/O-1E Bird Dog, which I built and flew as a control-line model. Much to my dismay, I haven't been able to find either kits or plans for it. I'm interested in kits or plans that would accommodate engines in the range of .25 to .80 cubic inches. I'd greatly appreciate any assistance you could provide me in this venture. I enjoy reading your magazine for the latest information on R/C models. Keep up the good work.

ANDY GEARHART
Mound, MN

Andy, it's interesting that, as nicely proportioned as the Bird Dog is for a scale model, there aren't many kits from which

to choose. Hobby Dynamics has a 1/5-scale version, which we reviewed way back in the July '82 issue of MAN. Sig used to sell one that was originally designed for free-flight, but would certainly be workable as a .10- to .15-powered R/C version, especially with today's smaller radios. If absolute scratch-building (including scaling your own plans) appeals to you, we published a beautiful set of scale drawings, in multiple parts, starting in our February '71 issue. Hope this provides some help.

RAU

Hot Glue vs. Epoxy

I'm just a beginner in the R/C world and am fascinated with it. I haven't had the chance to fly, but building a Sig Kadet is great fun. I'm glad the local hobby shop steered me away from ARFs—nothing

LAS VEGAS,
NEVADA

Q.S.A.A.

INTERNATIONAL

OCTOBER
26 THRU 29
1989

13th ANNUAL FLY-IN

LARGEST 1/4 SCALE EVENT IN THE WORLD



FOR Q.S.A.A. MEMBERSHIP APPLICATION, RENEWAL FORM AND DETAILED INFORMATION, SEND A LONG STAMPED SELF ADDRESSED ENVELOPE TO:
Q.S.A.A.
P.O. BOX 13980
LAS VEGAS, NV 89112

SHOWBOAT

Hotel, Casino & Lanes
2800 E. FREMONT • LAS VEGAS, NEVADA 89104

CALL TOLL FREE
1-800-826-2800
or dial direct **702-385-9123**

Make room reservations early & tell them you are with Q.S.A.A. to receive room discount.

- ★ Four Days of Fun and Enjoyment
- ★ Headquarters - Showboat Hotel
- ★ Static Display
- ★ Flying Site, Eldorado Dry Lake
- ★ Banquet - Saturday Evening
- ★ Tables, Available to Manufacturers
- ★ All Aircraft Quarter Scale or Larger
- ★ Pre-Entry Only, Deadline September 24, 1989

personal to those who have ARFs—I'm having a ball building this plane.

I was wondering if electric glue guns could take the place of epoxy in any way? The glues range from light- to heavy-duty and have a cure time of 20-30 seconds. Could you let a beginner know the pros and cons of the guns?

Keep up the good work—and have you ever thought of going bi-weekly?

SAM JONES

Sault Ste. Marie, Ontario, Canada

Sam, your choice of a Sig Kadet as a building project shows that you've had some excellent guidance so far. It's a great trainer and should serve you well for your basic R/C flight training. As a general rule, electric glue guns with their heat-activated glue sticks are not accept-

able as epoxy substitutes. The reason is that the glue has very little, if any, penetrating qualities, which is key to good, strong joints. With epoxies, the longer the cure time (which allows for better penetration), the stronger the joint. Electric glue guns merely deposit molten glue in place, the "joint" being accomplished by the cooling of the glue.

Bi-weekly? Sure, I've thought about it—for about a nanosecond—just before the rest of the Air Age team stormed into my office!

RAU

Navy Falcon Colors

In addition to being an enthusiastic beginner in R/C, I'm also very much into static, plastic models. I have a modest air force of 16 planes, including, among others, four F-16s, an SR-71, a MiG-29 and an

F-21 (KFIR).

Where can I get accurate information (i.e., color schemes and performance stats) on the new F-16N? I have a 1/72-scale Falcon that I'd like to paint to match the "N" model, and, some time down the road, I'd like to model a ducted-fan jet after this spectacular bird. (Ambitious? You bet!) I'm writing to you because I didn't know where else to go!

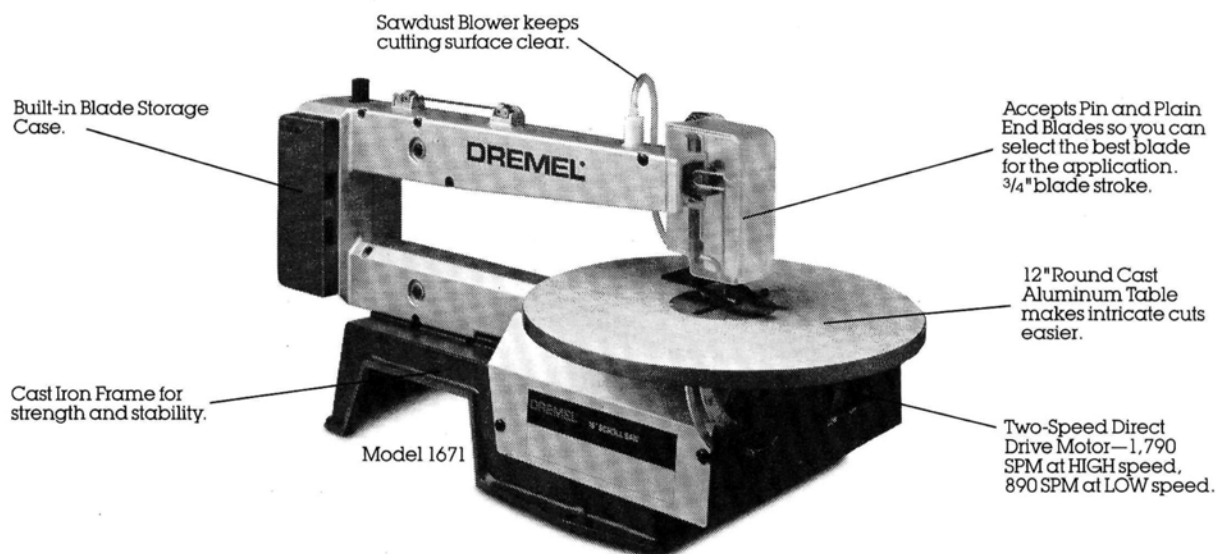
I found MAN's "Jet Special" issue very good reading. Keep up the good work, and let's see an F&B on the Goldberg Eagle 2!

MARK WELTER
Indianapolis, IN

Mark, I've seen some good color shots of the "N" model in various publications, so, apparently, they're available. I'd suggest

(Continued on page 10)

FINALLY A SCROLL SAW THAT DOESN'T CUT CORNERS.



The new Dremel two-speed Scroll Saw gives you all the features of the most expensive saws, except one. The price.

How'd we do it? Using the same Dremel engineering that's been bringing you intelligently-crafted,

affordable power tools for over 50 years.

So if you're looking for a quality scroll saw that'll make your most intricate work a breeze, ask about the new 16" Scroll Saw from Dremel.

And cut those expensive saws down to size.

DREMEL®

© 1989 Dremel

FREE

AVAILABLE NOW

Hobby Shack

SPORT FLYER!

64-PAGES LOADED WITH BIG DISCOUNTS

Call Today for your July/August 1989 Summer Edition



A Must For All R/C'ers

A must for all R/C'ers, the SPORT FLYER is 64 big pages just loaded with hundreds of unadvertised items not found in national magazines—and all at discount prices for BIG SAVINGS. Be the first to see our newest items! Get in on all of our unadvertised sales! To get your free copy, call us today, or write Hobby Shack and request your FREE Sport Flyer. Don't wait, do it right now!

Call Us Today Or Mail In This Coupon
For Your FREE Sport Flyer—Do It Today

(714) 963-9881

☒ Rush me my FREE SPORT FLYER

Name _____
Address _____
City _____
State _____ Zip _____

HobbyShack®

18480 Bandilier Circle, Dept. HM089
Fountain Valley, CA 92728-8610

Airwaves

(Continued from page 9)

you start with the P.R. Department of General Dynamics in Fort Worth, TX. Since some of the Navy Falcons operate in and around Fightertowntown, USA (NAS Miramar, CA), a letter to their Public Information Office might help. Aerotech Photography, 33 Mon Repos Lane, Lake Ronkonkoma, NY, also has a huge selection of military aircraft slides, which include a variety of F-16 schemes. We just reviewed the CGM Eagle 2 in our July issue.

RAU



R/C Osprey

I'm sending you a few shots of my latest project, the V-22 Osprey Tilt-Rotor by Bell/Boeing. I have a few photos from Harry Julian, Boeing's rep in Canberra. It's approximately 1/10-scale, weighs 21 pounds and has two S.T. 90 engines. I rotated the front of one 90 degrees to make it run clockwise. They drive 13x8 Zinger props. I had trouble getting a pusher prop big enough. It has 10 Hi-Tex servos with Futaba S134s tilling the engines, which have Perry pumps. The retracts are by Giezendanner of Switzerland. The whole thing is driven by two packs of SR batteries. The wireless is a Challenger 720, which was described in your December issue. My main trouble is I would like a gearbox to gear down to about 500rpm like the real thing, then I could put some fixed helo blades on it. The engines are held in place by helo blade holders in reverse. All the best and thanks for a great magazine.

PAT LEAHY

Canberra, Queanbeyan, Australia

Pat, your Osprey appears to be quite a project. The real V-22 has recently flown,

but the program's future seems somewhat clouded and could even fall under the axe of defense budget cuts. Gearboxes that would allow you to obtain the rotor speed you're looking for could likely be obtained from some of the existing helicopter manufacturers. I'd suggest contacting them; I'm sure you'll find them most helpful. We'd sure like to see some flight shots, and perhaps a story for our Helicopter Section!

RAU

Desperately Seeking Perfection

I'm a newcomer to the hobby, and your magazine has helped me decide what planes, radios, motors, etc., I should buy to make "the perfect plane." Could you write an article on (or direct me to a back issue about): the Airtronics Vanguard FM; any of the Carl Goldberg Eagle series (i.e., The Eaglet 50, Eagle 63, Eagle II); and either a Magnum motor or one from K&B Mfg. Your magazine has been an invaluable tool in helping me to get into this incredible hobby. Thank you! Thank you! Thank you!

AARON GAGE
Woodland, CA

Aaron, my first recommendation would be to check out our "Trainer Issue" of December 1988. It contained reviews of a variety of models that, for different reasons, could work well for the beginner. Last month's issue contained a review of the new Carl Goldberg Eagle 2, which appears to be an excellent airplane. As far as the "perfect plane"...just about the time I made a recommendation, a newer, more perfect plane would appear!

RAU

Frequency Folklore

Hello RAU? Those empowered to reach many people with their wisdom and advice (a position you hold) can create much animosity, distrust and discouragement, and can hurt the hobby/sport when information put out as fact is patently incorrect. About 18 months ago, you advised a serviceman with a European APO who asked about frequencies for flying aircraft

(Continued on page 12)



Learn from the pros at Top Flite!
Step-by-step **MONOKOTE**® application details in clear, easy-to-follow, full-color close up action! Wings. Fuselage. Trims. Color-on-color. Designs. Hinging. Basic through advanced heat gun and iron usage techniques.

(Each tape approximately 1 hour).

"MONOKOTE® I"

Basics on Wings, Tail Sections, Fuselages, Hinging, Color Schemes and Trimming.

"MONOKOTE® II"

Advanced Color Schemes, Designs, Wing Tips, Multi-Color Combos, and MORE!

"MONOKOTE® III"

Airframe Prep, Advanced Wing Tips, More on Hinging, Color-on-Color, Graphics, Painting, and MORE!

"MONOKOTE® IV"

More on Wing Tips, Canopy Covering, Advanced Graphics, Striping, Car Bodies, and MORE!

"MONOKOTE® V"

Detailing Chrome, Scale Tips, Concave Surfaces, Fragile Wing Tips, and MORE!



GREAT FOR CLUB MEETINGS!

RENT OR BUY!

\$39.95 each

(\$20 Refund per tape on Rentals, if returned undamaged within 30 days.)
Please specify I, II, III, IV, or V with order.

SPECIAL PURCHASE - ONLY COMBO OFFER

Combination 2-hour long tapes
(Specify I & II or III & IV)
Only \$65 each! Save \$14.90!
(Sorry, no rentals available on Combo tapes)

Send check or M.O. with Name, Full Address and choice of VHS or BETA format to:



TOP FLITE MODELS, INC.
Monokote Video Course
2635 S. Wabash Ave.
Chicago, IL 60616

Airwaves

(Continued from page 10)

that only the 72MHz band was allowed in the USA. Read the rules and get the facts: 27, 50 and 53MHz (with license) are usable in most areas with less trouble than the 72MHz band and many fine narrow-band FM sets are available in Europe on 27MHz but *not* on 72MHz. Methinks you screwed someone out of getting a good radio for a good price. In your May '89 issue, you advise that a Controilaire on 27MHz cannot be updated to '91 specs. Why change what don't have to be changed? The "update" only applies to the 72 and 50MHz bands which will have closer frequency spacings for R/C than the 27 and 53MHz bands. Get your act together or quit giving out R/C advice!

HOWARD L. CHAPMAN
Watsonville, CA

Mr. Chapman, I'm afraid your interpretation of our response is "patently incorrect." The reason only the "numbered channels" in the 72 to 75MHz range was presented to the returning serviceman was based on the assumption that he did not possess the required FCC Technician License to legally operate in the 50-53MHz (6-meter) band (since he gave us no indication to the contrary). It also considered that, upon his return, he would be unable to purchase a contemporary radio on 27MHz. More important, though, is the fact that I wouldn't, in good conscience, recommend anyone use a 27MHz radio in an airplane. We're fighting a big enough battle educating uninformed sales outlets to the hazards of selling airborne frequency radios to some equally uninformed hobbyists, who will use them for surface operation in boats and cars; all in the 72 to 75MHz range. The 27MHz range is literally a radio sewer with everything from CBs, garage-door openers and radio telephones, in addition to R/C cars and boats. Narrow band or not (which is debatable), a 5-watt CB or 500-watt linear amplifier is going to knock the hell out of a 500MW (1/2 watt) R/C. If the Watsonville area is unencumbered by these problems: great, enjoy yourself. For most areas of the country,

though, flying an airplane on 27MHz is a high-risk situation at the very least. I had a discussion with Bob Underwood of the AMA and he put it much more succinctly: Although operation of aircraft on 27MHz is legal, it's not recommended. RAU

Rotary Reaction

Congratulations! I'm glad to see someone realizes that helicopters are here to stay. We heli fliers have been getting short-changed for a long time. The addition of a heli section to your magazine is a great idea that was needed for a number of years. When I started flying helicopters, it required a year's worth of magazines to find enough information to set up a machine. Craig Hath has been doing a great job in providing us information. His inputs have helped me through many a problem. Keep up the good work and give us more pages of info. Enclosed is a copy of The RotoReport, our helicopter club newsletter. We formed the club about a year ago, and at present we have about 20 members. There's an article in this issue regarding the assembly of the Kyoshō Concept 30 SE kit. I hope there may be something of use for you in this article for your review of this kit.

RUSSELL A. COXE
Germantown, MD

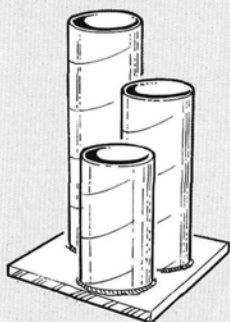
Thanks, Russ. We're glad you like it and hope other heli fans will find it interesting and informative also. Thanks for the copy of your newsletter; it appears you've got an active group there. We're presently preparing our Pad & Bench review of the Kyosho Concept 30 kit for a future issue.

RAU

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and length.

Hints & Kinks

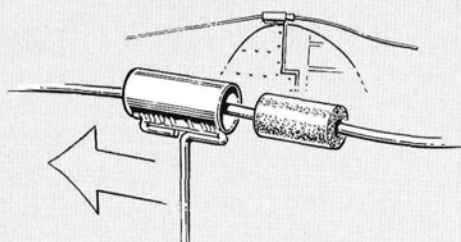
by JIM NEWMAN



WOOD STORAGE

This freestanding strip-wood organizer is made of cardboard tubes that have been glued to a wooden base. Tubes from inside wrapping-paper rolls or drafting materials work well, and they're long enough to accommodate full-length stock or leftovers.

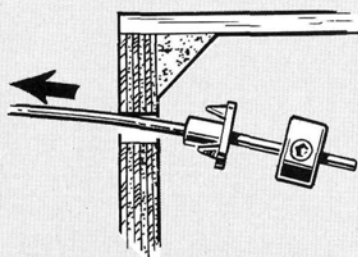
Keith Love, Milpitas, CA



ANTENNA ATTACHMENT

This simple fitting attachment works like a collet, is coaxial and eliminates unsightly rubber bands. A $\frac{3}{32}$ -inch-o.d. brass tube is soldered to a T-pin, and the antenna wire is threaded through a section of the smallest fuel line, which, in turn, is forced into the brass tube. It keeps the wire taut, but allows it to slip through if it becomes snagged.

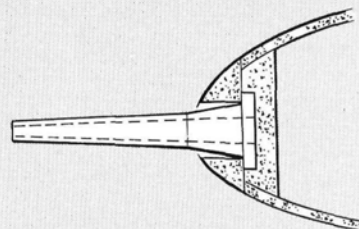
Wally Moulder, Amarillo, TX



BLIND-NUT FITTING

Did you ever install the fire wall and later realize that you hadn't first installed the blind-nuts? The solution? Feed music wire through the fire wall from the front until it exits the tank bay; then slip the blind-nut onto the wire and follow it with a securely tightened wheel collar. Using pliers, pull the nut into place on the wire and securely embed the prongs by tightening a screw and washer from the front of the fire wall.

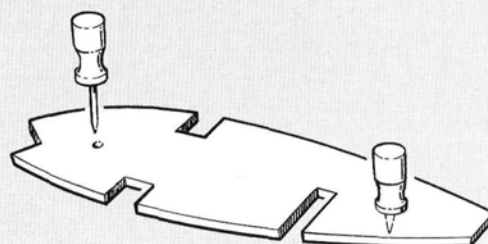
Roy Day, Rockville, MD



FLEXIBLE CANNON

To simulate cannon in the leading edges of sport-scale models, use the little nylon dipper tubes from bottles of "liquid paper" thinner. These flexible nylon tubes will survive the knocks that snap or bend other materials, and they can be suitably colored with laundry markers or Rit dye.

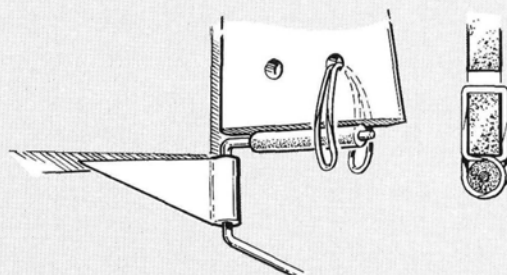
Bob Robert, Durrington, Wilts, England



AIRFOIL TEMPLATES

Use this non-slip template when cutting ribs. Make it from a durable material (e.g., aluminum, brass, Formica, birch plywood, or Plexiglas). Drill two or three holes and glue in thumb tacks. I like to keep the points short so that they don't go right through the balsa, because then I can slide the sheet around for the most convenient knife strokes.

David Rincon, Bogotá, Columbia

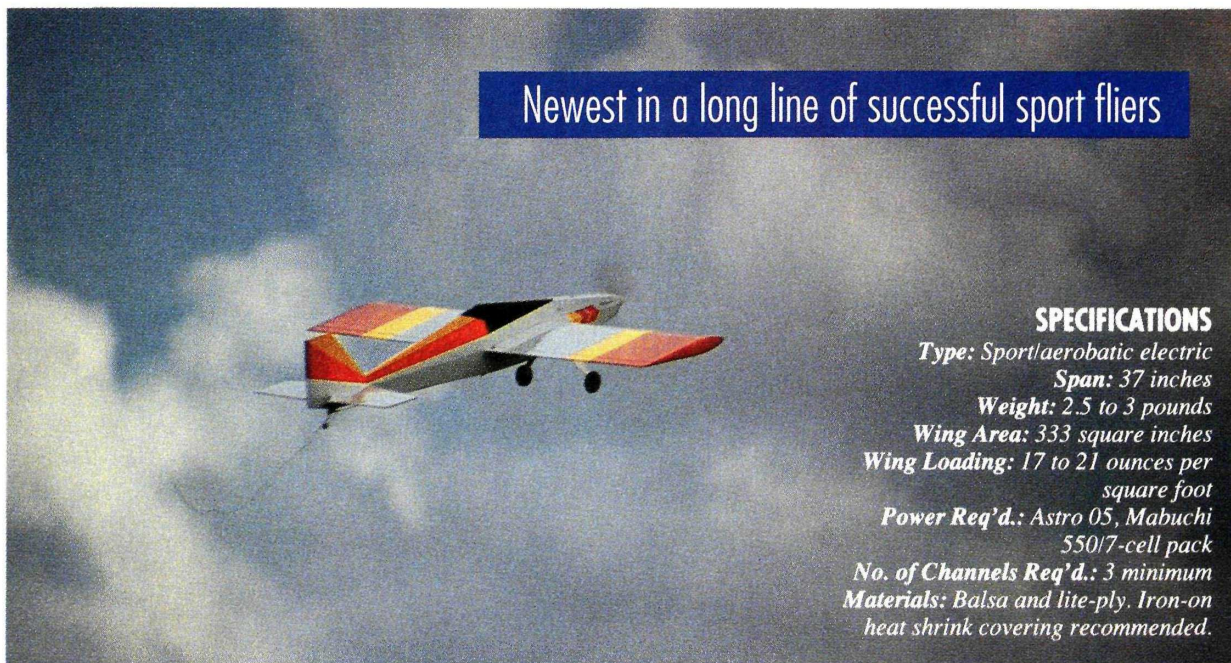


FLEXIBLE TAIL-WHEEL CONNECTION

Take the steering shocks off the servo teeth. Tail-wheel wire comes up under the rudder where it's captured by light rubber bands threaded through holes in the rudder. (Note the rubber or plastic tube around the wire.) Strengthen the balsa around the holes with CA or $\frac{1}{64}$ -inch plywood facing, and be sure to allow the bands a little "give."

Juan Pablo Movarek, Santiago, Chile

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



Newest in a long line of successful sport fliers

SPECIFICATIONS

Type: Sport/aerobatic electric
Span: 37 inches
Weight: 2.5 to 3 pounds
Wing Area: 333 square inches
Wing Loading: 17 to 21 ounces per square foot
Power Req'd.: Astro 05, Mabuchi 550/7-cell pack
No. of Channels Req'd.: 3 minimum
Materials: Balsa and lite-ply. Iron-on heat shrink covering recommended.

PHOTO BY WALLY ZOBER

'LECTRIC HOTS

by TOM STRYKER

SO YOU'RE NOT too excited about this electric-flight business yet, huh? You say the only electrics you've seen

just lumbered around the field for a lap or two before running out of juice? And I guess you have too much hot-rodding and aerobatics

in your blood to fly some slow, converted sailplane with an electric motor in its nose—right?

Well, stay tuned, because this little gem will satisfy anyone's appetite for aerobatics and speed. It's easy to build, inexpensive, cute as a bug and (best of all!) *electric-powered!*

Its lines derive from the popular Hots, which was originally designed by Dan Santich and presented, in each of its versions, in this magazine. The 'Lectric Hots is actually scaled down from the Super Hots because of its longer tail moment and sleeker fuselage.

After reducing the design to achieve the desired wing area and weight, logistical problems began to appear. The low-aspect-ratio, fully symmetrical wing concerned me because of the lower output of an electric motor. A major problem, though, was how to get four servos, a receiver, a receiver battery, a motor and a



The author poses with the 'Lectric Hots, making apparent its compact size.

What's Hot; What Hots??

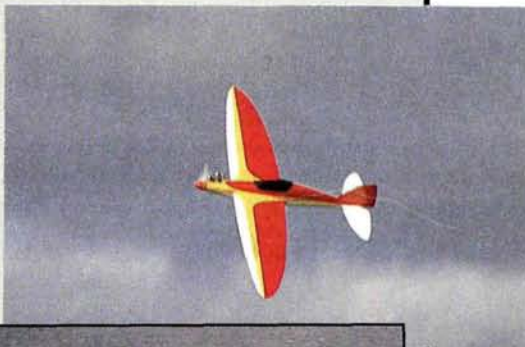
EVERY SO OFTEN, although infrequently, a design comes along that finds immediate acceptance among modelers. It's built in its original form by many fliers who then proceed to shrink it, enlarge it, add engines to it and modify it to suit their specific needs. Occasionally, the basic design becomes so popular that a manufacturer will kit it.

One such design is the Ugly Stik, which has been around, in various forms, for decades. Another is the Hots (plan No. 4841), which was originally presented in the April '84 issue of *MAN* and was designed by former editor, Dan Santich. He evolved the basic design into the larger Super Hots (plan No. 2861) and still later, into the Big Hots (plan No. 11861), which appealed to the large gas-engine fans.

The wing planform and quantity became the next candidates for variation, with John Bech-Hansen choosing a graceful elliptical shape for his aptly named Hotselliptic (plan No. 4871), and Floyd Manly went through the wing thing twice to produce the Super Hots Bipe (plan No. 10871).

With the growing popularity of electric power, Tom Stryker took a look at the basic airframe, once again re-sized the package, added an electric motor and battery pack and produced the 'Lectric Hots (plan No. 8891). This should now make some form of Hots available in virtually every size, for nearly every kind of propulsion package ... nearly. When do you suppose—if ever—we might see a Fan Hots, a Heli Hots, or a 12"=1' version—called UltiHots, maybe??

RAU



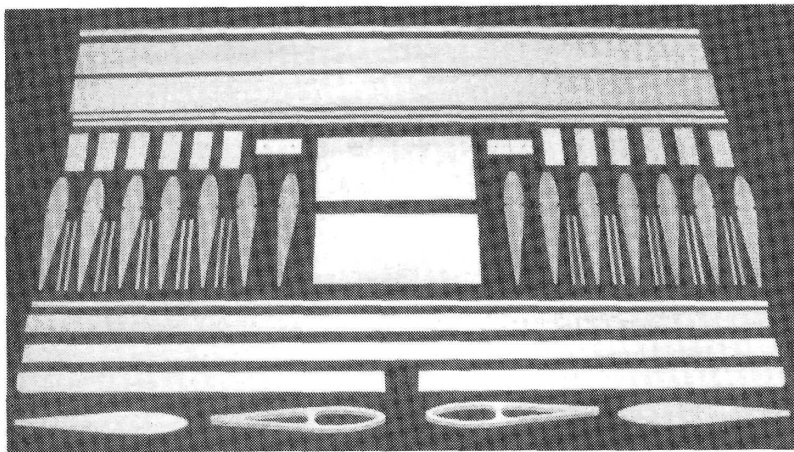
motor battery in around that darn mid-wing.

After using several sheets of drafting paper and numerous erasers and developing three gray hairs, I came up with a pretty good system: A large top hatch is easily removable to expose the motor battery (held in with Velcro) and three of the servos. By disconnecting the elevator and rudder servos and removing three 4-40 hex-head screws, the wing can be removed. Because of its smallness (37-inch span), you probably won't need to, or want to, remove the wing after each flying session.

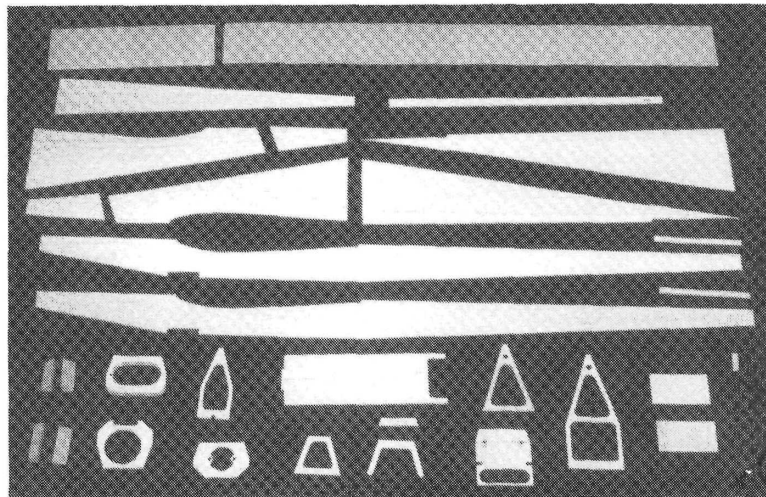
The 'Lectric Hots is designed for a "hot" 05-size motor. The obvious choice is the Astro Flight's* Astro Cobalt. Other 05s will work well, but with slightly less (but still very acceptable) performance. The battery is a standard 7-cell car pack, in almost any configuration. You can hardly go wrong with the popular Sanyo* 1200mAh SCs. Sanyo's 900mAh SCRs work well and provide a more spirited performance because of their lighter weight, but they have a proportionally shorter flight time. SR's* new 1700mAh batteries are the same size and weight as

most 1200s, and they're my favorites because of their extra duration. Using the Astro Cobalt motor, you can generally expect 3½ minutes of full power with the 900mAh batteries, 4½ or 5 minutes with the 1200s, and perhaps 6 minutes with the 1700s. These times might sound short to you "wet" fliers, but you can pack a lot of action into each flight with this exciting little package!

CONSTRUCTION: Half the battle of obtaining a light airframe is using the minimum number of parts to get the job done (this also makes construction quite simple). The other half is, of course, care-



Left: The initial wing framing, built on a flat surface. Below: The stabilizer and fin assembly is ready for mounting on the fuselage.



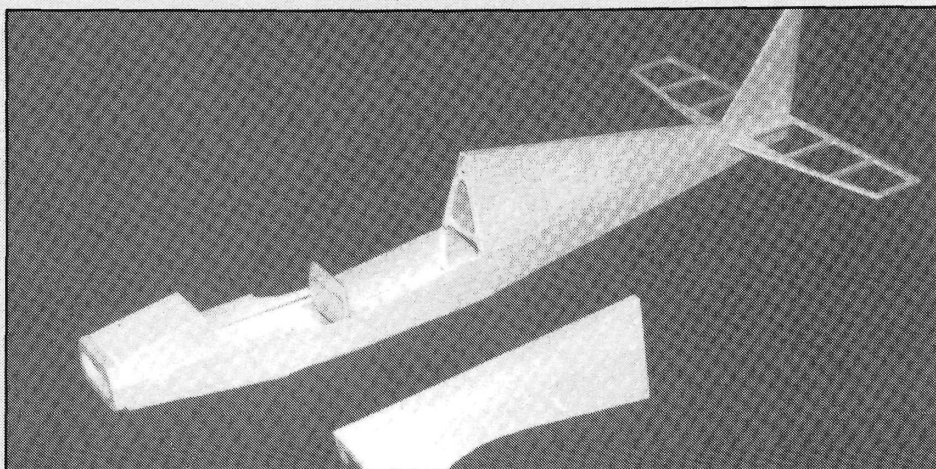
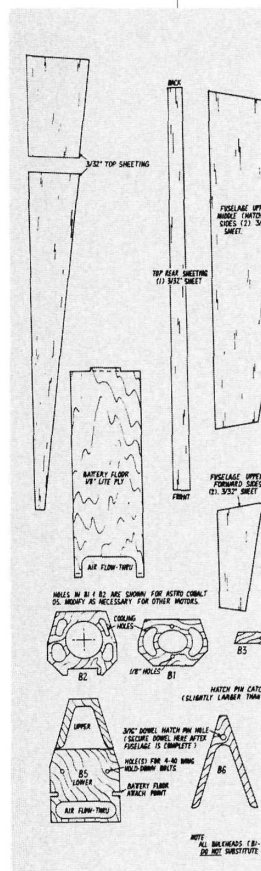
ful selection of wood at your local hobby shop to ensure that no piece is heavier than necessary for its intended purpose. The only pieces that require any special shaping are the wing's leading and trailing edges, which are band-sawed or carved out of $\frac{1}{4}$ -inch balsa to the angles shown on the plans. Medium and thin CA, and a little accelerator, are the only adhesives you'll need.

The wing is unique since, although it's fully symmetrical, it's built on a flat surface with no jig or tabs. Pin the ribs to the building board/plans; then add the top spar and the leading and trailing edges. Attach the front and rear sheeting, the cap strips and the

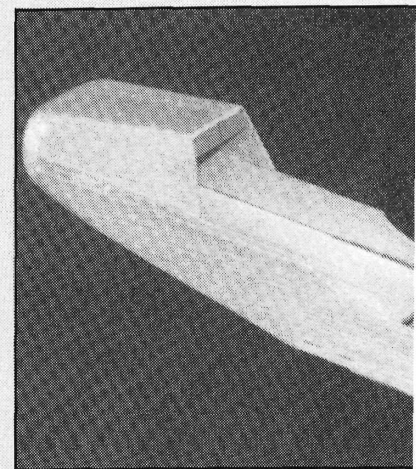
center sheeting. Turn the wing over, pin it to the board, and add the other spar. Place the $\frac{1}{16}$ -inch shear webs between each rib, except for on either side of the center (partial) rib. Here, attach the two $\frac{1}{8}$ -inch lite-ply pieces with 4-40 blind-nuts inserted. Secure the blind-nuts with CA, because if they pop out later while you're screwing in the wing bolts, it will be a major inconvenience

to replace them. Add the sheeting and the cap strips; then remove the wing from the board and round-off the leading edge. You'll probably think you've built only half a wing, but that's all there is!

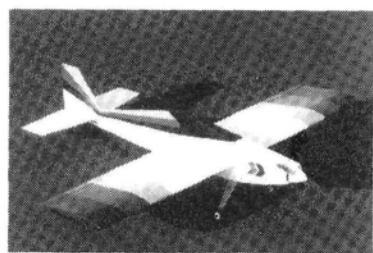
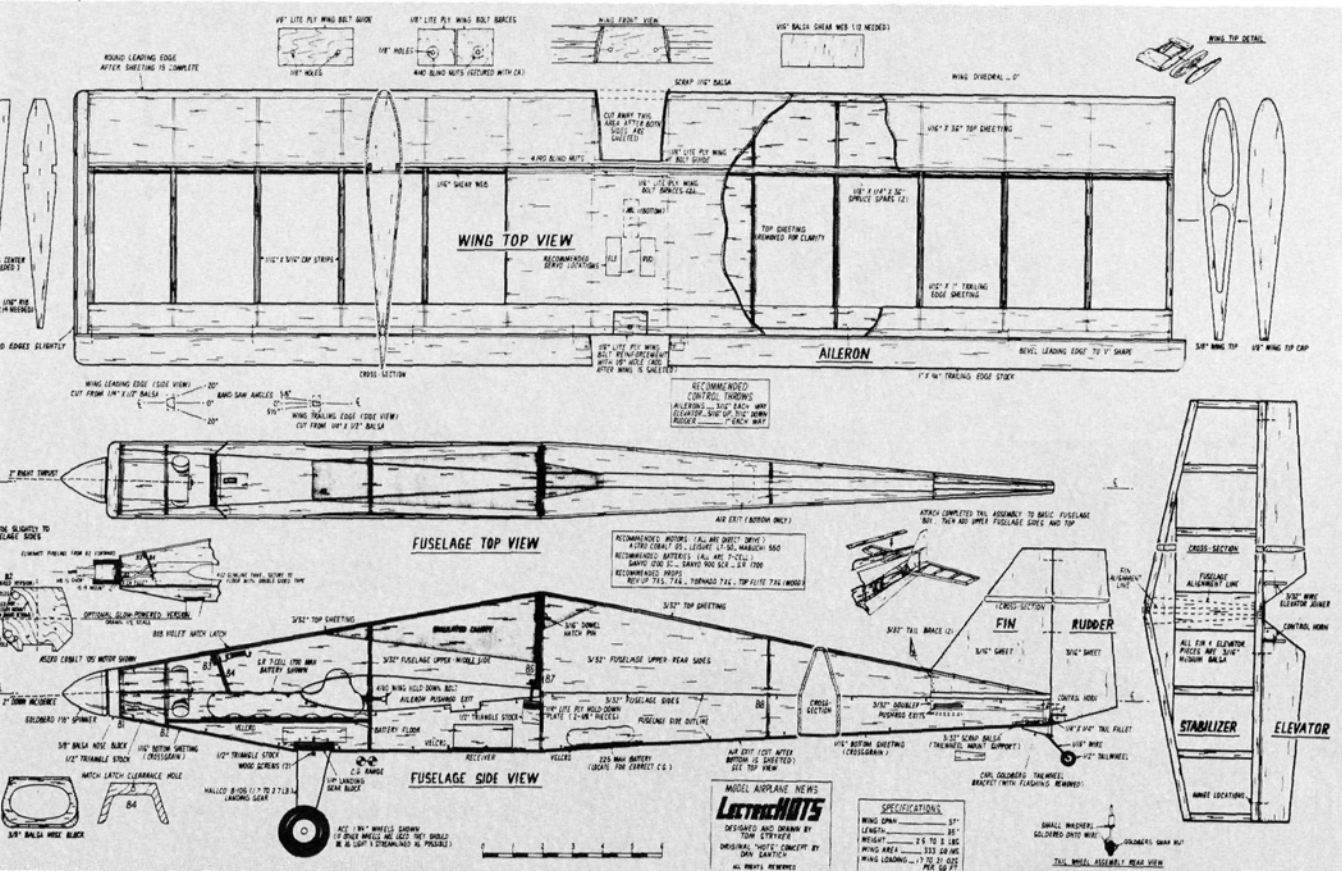
Using your trusty X-Acto knife, cut away the leading edge and sheeting between the two full center ribs. Leave about $\frac{1}{4}$ inch of sheeting on the top, $\frac{1}{8}$ inch on



The completed fuselage, tail assembly and hatch, just before final sanding.

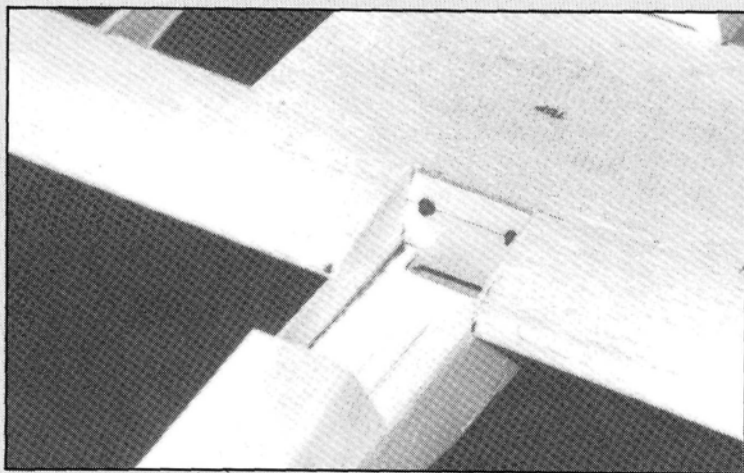


The basic fuselage structure is simple and lightweight. The removable hatch allows quick battery changes at the field.



#8891 'Lectric Hots \$8.50

Tom Stryker's 'Lectric Hots is the latest addition to the series of "Hots" airplanes presented over the years by MAN. This 37-inch span cutie is specifically designed to use 05 electric motors, which are growing in popularity. The 'Lectric Hots carries on the tradition of its predecessors by being an easy-to-build sport flier with the capability of operating quietly from small fields. Conventional building materials are used, and intermediate flying skills are required. Plans show alternative .15 gas-engine installation.



The wing cutout and mounting technique are seen clearly here.

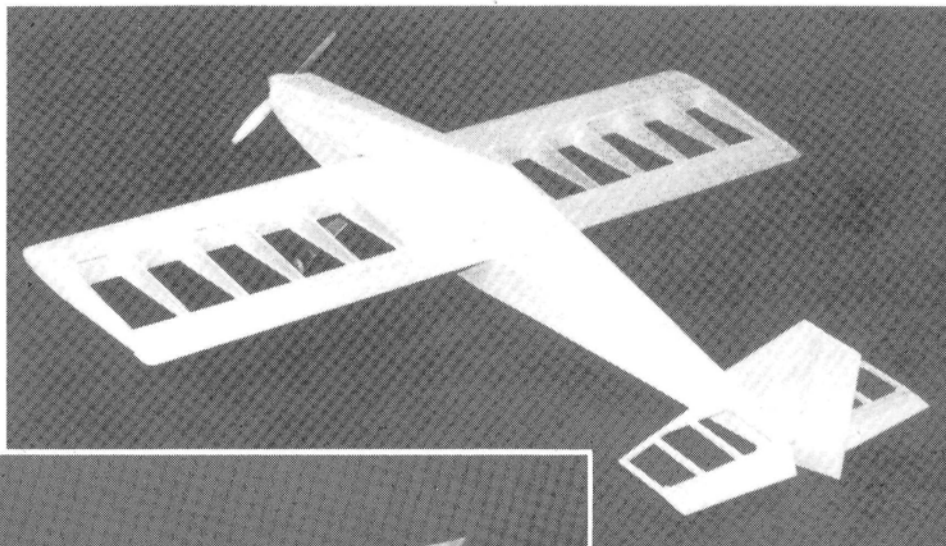
the bottom and $\frac{1}{8}$ inch in front of the ribs to work with. With a block sander, shape to the angles shown on the plans. Attach the other $\frac{1}{8}$ -inch lite-ply piece to the front of the spars, ensuring that the screw holes line up with the blind-nuts behind them. Add $\frac{1}{16}$ -inch scrap balsa to the sanded areas and trim it to shape.

Add the wing tips and caps and round-off the corners slightly.

Sand or carve a "V" on the front of each aileron for future installation, and the wing is complete.

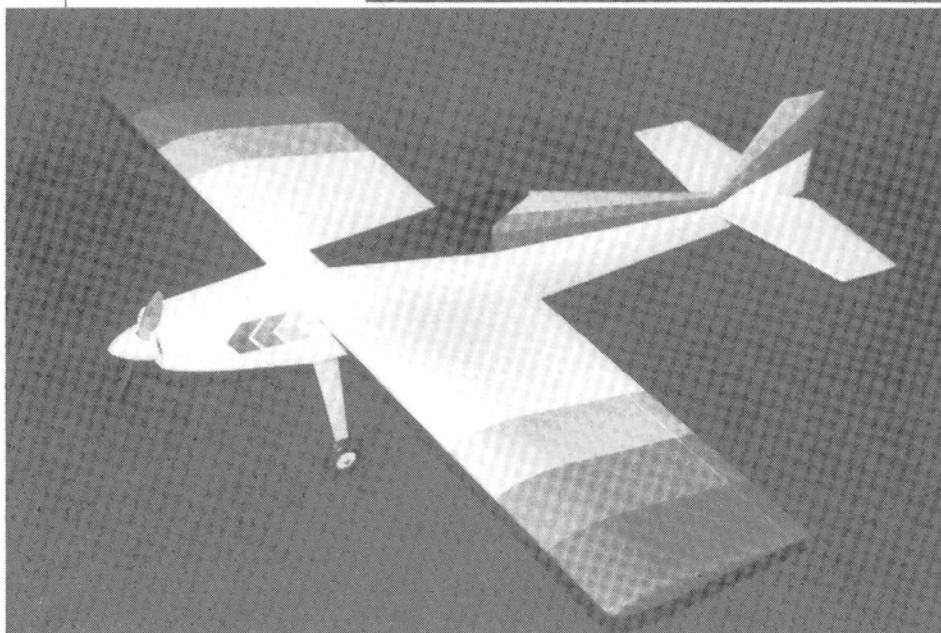
The tail surfaces are self-explanatory and are built of $\frac{3}{16}$ -inch light to medium balsa. After completing all the parts, align and attach the fin to the stabilizer, then add the two $\frac{3}{32}$ -inch tail braces.

Begin the fuselage construction by cutting out all the parts and modifying B1 and B2 for your choice of motors. The parts shown on the plans are for the Astro Cobalt motor, con-



Above: With everything fitting well, it's ready for covering.

Left: The littlest, and certainly quietest, member of the popular Hots family.



obtain a snug fit.

Slightly block-sand the tops and add the $\frac{3}{32}$ -inch top sheeting. Also block-sand the front of the fuselage (flush with B1) and attach the $\frac{3}{8}$ -inch nose block. Insert the $\frac{1}{4}$ -inch rear wing (two $\frac{1}{8}$ -inch lite-ply pieces laminated) and the hold-down brace with 4/40 blind-nut installed.

figured as it has been for the last couple of years. The two mounting holes in B1 are vertical, and this allows the most room for those obtrusive motor brushes. Earlier Astros, as well as most other motors, should have the mounting holes arranged horizontally. Also ensure that your motor will fit through the hole in B2.

Prepare the $\frac{3}{32}$ -inch fuselage sides by adding the $\frac{1}{8}$ -inch stringers, $\frac{1}{2}$ -inch triangle stock and $\frac{3}{32}$ -inch stab reinforcement. Attach B2 and B5 to their respective ends of the $\frac{1}{8}$ -inch lite-ply battery floor, and mount these pieces to one fuselage side. Secure the remaining bulkheads to the same side, noting the 2 degrees of downthrust and right thrust on B1. Also note the angle B8 will need when the fuselage sides are brought together.

Attach the other fuselage side, constantly checking for squareness and alignment. Glue in the

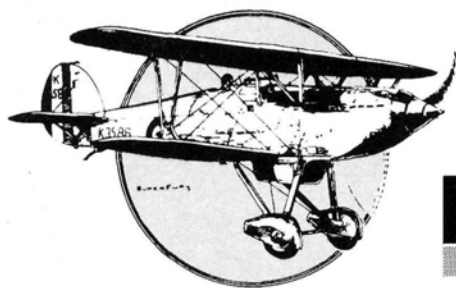
$\frac{1}{4}$ -inch lite-ply landing-gear plate (two $\frac{1}{8}$ -inch pieces laminated together). Add the bottom $\frac{1}{16}$ -inch cross-grain sheeting, but only from B1 to B7 at this point. Bring the fuselage rears together, trying to keep the bend as sharp as possible behind B7 (without cracking the balsa). Add the $\frac{1}{4}$ -inch rear post and the $\frac{3}{32}$ -inch tail-wheel brace, and sheet the remainder of the bottom. *Do not* add the upper fuselage sides yet.

The next step will be to align and glue the stabilizer/fin assembly to the rear of the fuselage. (Use the upper rear fuselage side as a guide for its exact location.) With the stabilizer/fin in place, add the upper rear and upper forward fuselage sides. Check that the bevel on the bottom of each will match the tops of the fuselage sides. Trim with an X-Acto knife, if necessary. The rear, where it meets the stabilizer/fin, will need the most attention to

Paying careful attention to alignment, assemble the upper hatch. Secure the $\frac{3}{16}$ -inch dowel pin in the hole in B6, and add your choice of latch to the front. Bob Violett Models'* Violett Hatch Latch works well for this, and it can be mounted with CA.

Trial-fit the wing at this point. Place the wing straight down into the saddle, with B5 fitting snugly against the $\frac{1}{8}$ -inch lite-ply piece in the wing's center cutout. Compare the wing's alignment with the stabilizer, and trim the wing saddle to make any corrections. Check the alignment of the wing-bolt holes in B5 by inserting 4/40x $\frac{3}{4}$ -inch (or longer) hex-head bolts through them and into the holes and blind-nuts in the wing. Check for squareness of the wing (there should be an equal distance from each tip to the rear of the fuselage), then drill a $\frac{1}{8}$ -inch hole in the rear of the wing

(Continued on page 129)



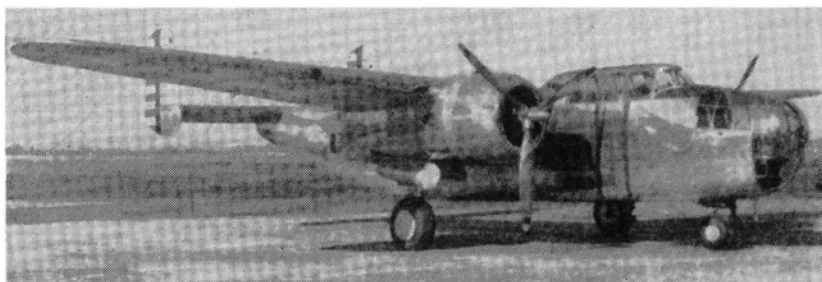
Fifty Years Ago

by KATHERINE TOLLIVER



AUGUST 1939: The world was holding its breath. Hitler had signed a non-aggression pact with the Soviets and was about to pounce on Poland. On August 22, Albert Einstein wrote Roosevelt a letter alerting him to the potential of the atomic bomb, and on August 25, Mussolini told Hitler that the Italian Air Force was facing a serious fuel shortage.

While Italy was worried about fueling their planes, MAN was fueling imaginations with a report on the the Italian bomber, the Savoia Marchetti. This sleek plane, which appeared on the August cover, was 53 feet, 2 inches long and had a wingspan of 66 feet, 3 inches. Capable of climbing to 9,840 feet in 9 minutes and to 13,120 feet in 13 minutes, the SM-79B's cruising speed was 231.24mph. Basically a cleaned-up version of the SM-79 with the nose engine replaced by a gunner's position, the SM-79B Heavy Bomber was a twin-engine, high-performance monoplane of composite construction. The single cantilever wing was built in one piece on a structure of three double T-section spars, solid plywood compression ribs, and a plywood outer skin. The wing was divided into a series of watertight compartments, and the entire structure was covered with doped fabric. With the bomb compartment lo-



The North American bomber showing its "new" type of motor-mounting system that places most of the engine below the wing leading edge. Easy to see the subsequent B-25 features.

cated in the central portion of the fuselage, the total bomb load was 2,750 pounds.

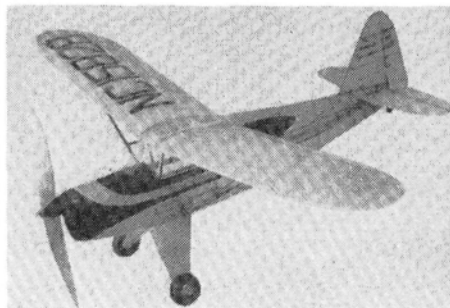
Building a model of the SM-79B appealed to "you detail hounds who are in your glory when spending 40 hours on a single landing-gear assembly." What's more, MAN's new silhouette cross-section templates would make the job easier. While all those "detail hounds" were busy setting up their workbenches for the SM-79B, the Italians were churning out the full-scale version. Fifty planes had already been completed, with over 100 more on order.

Given the state of world events, a workbench must have been a nice place to get away from it all. One young man thought so anyway. The "Airways" club news featured a photo of him at his workbench surrounded by "a lot of neatly arranged debris"—his idea of modeler's heaven. Photos sent in by other modelers included some fine workmanship showing the uncovered framework of a Boeing 314

Clipper. It had a span of 47 inches and was later covered with sheet balsa. Built from Boeing blueprints, it had taken about 150 hours to build. Perhaps the most impressive photo was that of a flying scale Rearwin speedster. It flew for 1½ minutes, had a span of 30 inches and weighed 2½ ounces with 12 strands of 1½-inch rubber.

By the end of August '39, the U.S. Air Corps had a strength of 26,526 officers and men. Of the approximately 1,500 tactical aircraft, only about 800 were classified as standard on first line. In contrast, the German Air Force had a personnel strength of more than 500,000 and a first-line aircraft complement of 3,750.

MAN reported that the Air Corps and President Roosevelt were well aware that they were lagging far behind. (The latest model of the P-36 had an operating speed of 270mph and a ceiling of 32,000 feet, whereas the British Spitfire had an operating speed of 312mph and a ceiling of



Right: What every home should have. Workshops haven't changed much! Left: Earl Stahl's scale Rearwin speedster flew for 1½ minutes on 12 strands.



Frank Ehling was known for his unusual designs, and this mono-wheel triangular cross section was typical.

35,000 feet.)

Only in the field of heavy bombers did our Air Corps rank first. The B-17 was superior to the German Focke-Wulf and to the British Manchester, but, by September 1939, the Air Corps had only 23 Flying Fortresses (including three experimental B-17As). In response to the need for fast, light, attack bombers, three companies (Stearman, North American and Martin) each sent a new, high-speed bomber to Wright Field. Reports circulated that they were capable of speeds in excess of 300mph while carrying at least a half ton of bomb load.

Each plane had shatterproof, transparent glass panels on the upper portion of the fuselages, as well as flush rivets to cut down on drag. The wings of all three were full cantilever, and fuselages were of an all-metal, semi-monocoque construction.

A new type of motor-mounting system was used on North American's entry, which used two 1350hp Wright motors. The nacelles hung entirely below the wing, although they were actually built into the wing structure. About two weeks after it arrived, the \$500,000 NA-40B crashed. It was flying at about 700 feet when something went wrong. The pilot almost made it back to the runway, but at about 15 feet above the ground, on final approach, the plane suddenly crashed and burst into flames. Those few seconds before the crash were enough for the crew

to open the emergency hatch and jump to safety.

While high-speed bombers were entering competitions at Wright Field, MAN was asked to enter a model in the Wakefield International Contest. The model was completed in eight days, and it was designed and built with the intention of having it fly better using 16 to 20 strands of rubber in calm air, depending on the air conditions. Using a 19-inch propeller on the maximum number of winds, it had a prop run of about 2 minutes. The fuselage was planked, paper-covered and doped with banana oil, and the progressive airfoil was almost flat at the tips to lessen tip drag and decrease the stall speed.

Christened the "Groundhugger," it flew on any power from 18 strands of $\frac{1}{8}$ inch to 18 strands of $\frac{1}{4}$ inch, and it was airborne on the very first attempt with the CG at about 50 percent of the chord. The Groundhugger placed 4th at the Wakefield Contest.

Previewed in the "Gas Lines" column were some of the planes entered in the 1939 Nationals. One well-designed entry had a 5-foot wingspan, was Brown-powered and weighed 2 pounds, 4 ounces. Its large lifting tail and twin rudders helped prevent spinning. A monowheel landing gear reduced resistance and enabled the plane to take off unaided.

One gas model was equipped with one of the first, practical, automatic retractable landing gears. The plane weighed about $5\frac{1}{2}$ pounds and had a $6\frac{1}{2}$ -foot wingspan, and, it was powered by an Ohlsson Gold Seal engine.

Another unusual entry was actually a $28\frac{1}{2}$ -ounce miniature floatplane that took off from the water with only a 6-foot run. The use of a high-lift, high-cambered airfoil adequately compensated for the small wing area.

A very small gas job weighing only 15 ounces was entered with a wingspan of



The "Groundhugger" placed 4th at the Wakefield International Contest. This design by Frank Zaic was built, flown and trimmed in just over one week!

only 24 inches and an overall length of 15 inches. The wing loading was 15 ounces per square foot and a regular size 2-cell coil provided the spark for the Brat motor. (One of the first "Small Steppers"?)

At the East Paterson, NJ, contest, Frank Ehling was shown with his plane that won 2nd place in the Class A event. Mr. Ehling, whose name was familiar to many readers, delighted in building radically designed ships and proving that they were aerodynamically stable. Living up to his reputation, he was shown "with the same old smile, but with a new freak gas job."

In August 1939, a frail old man stepped off a tour bus in North Carolina to view the site of the Wright Brothers' famous flight made 35 years before. No one paid any attention to him as he listened to the tour director drone on. Orville Wright liked coming to this spot; he'd been on this tour before. On the eve of another war, he stood unnoticed and alone. There was a time when he thought his planes would be a deterrent to war ...



Basics of Radio

by RANDY RANDOLPH

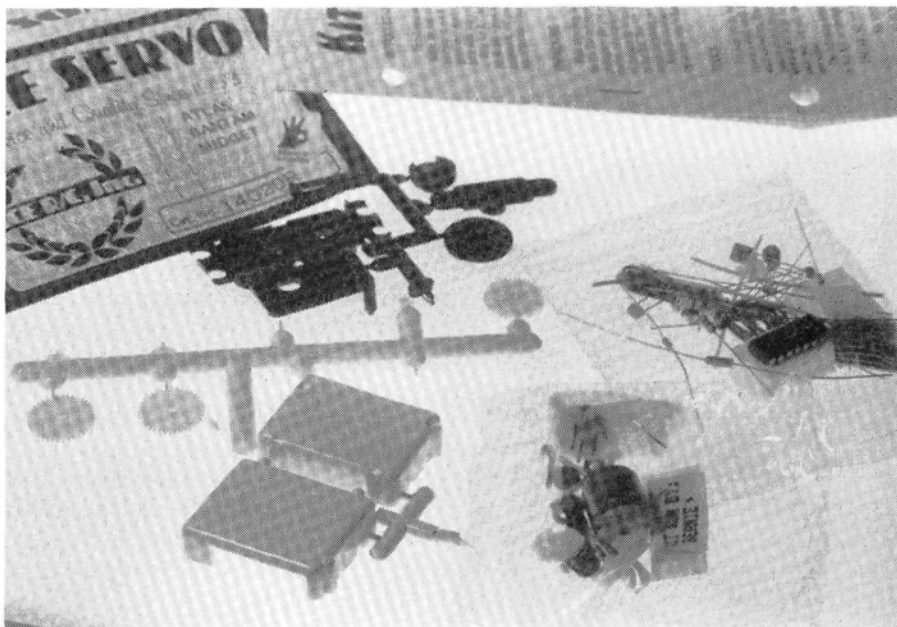
SOME TIME AGO, I mentioned that a dollar sent to P.O. Box 271048, Dallas, TX 75227, would buy you a print-out of a computer program that I use to compare the performance of different airplanes. Since the program was written in Atari 8-bit basic, I didn't expect a lot of response. Boy, was I mistaken! Since most basic languages are similar, it wasn't difficult for owners of other computers to rewrite it for different machines, so folks with all kinds of hardware sent for a copy. One gentleman, Peter Clarke (1665 Greenleaf Ave., Des Plaines, IL 60018-3832), even dressed it up after converting it for the IBMs, and he offers a dandy disc. I understand it's even up on some national bulletin boards; in short, it has been popular!

It seemed that the numbers were available in the program for a simple formula that would give some indication of flying speed as well as the other parameters. So, all you folks out there who received the original can add the following lines, and the program will do just that! Those who converted it to other hardware can make the additions in the appropriate places.

```
545 SF = INT ( (V6*2*W2*10) *100+0.5) / 100
891 PRINT "SPEED FACTOR =" ,SF
892 PRINT
1293 PRINT #1 "SPEED FACTOR =" ,SF
```

There are a number of factors that enter into calculating the speed of an airplane that aren't considered in this simple notation, but it will offer a comparison that's in the ballpark. It's based on wing loading and Joe Wagner's wing-volume theory. In tests run on five different airplanes, the numbers the program returned were surprisingly close to the actual cruise speeds of the airplanes tested.

This column has mentioned Ace R/C* so often over the years that it has been accused of favoritism. But, that isn't exactly the case! The Heathkit* people have dominated the radio, television, audio and computer kit business for a number of



This is the way an Ace servo kit comes out of the package. The instruction sheet tells how to get it all into the case!

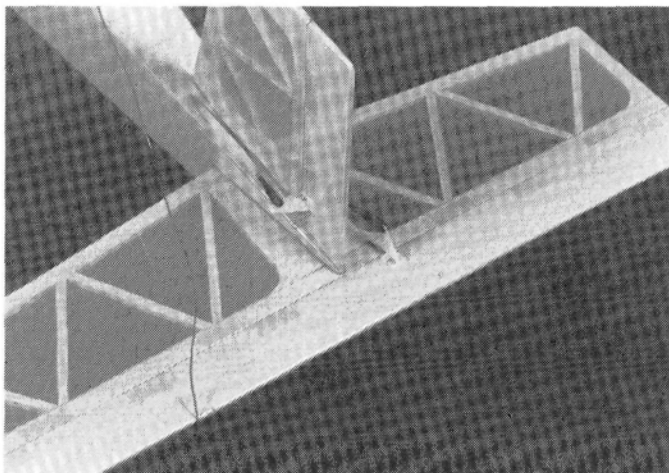
years, and the same can be said for Ace in its specialty—model hobby electronics. To my knowledge, there's no one else in the business of supplying kits for the kinds of electronics that are peculiar to R/C airplanes. Considering this, it's a wonder that Ace produces the quality products it does at such reasonable prices.

In the past, I've stated that one of the

best ways to understand how our radio systems work is to build one! That's a tall order and one that would be rather difficult for a lot of people to accomplish. Building a small part of a system is much less difficult, and the chances of success are better than if the whole system is attacked at once. Pictured is one of Ace R/C's servo kits, which is a good place to

start. These kits are inexpensive and an excellent way to get acquainted with what's in the box.

The servo is the "muscle" of the control system and is the device that changes the transmitted pulse into the physical movement that causes control surfaces to react to our command. What better place to get acquainted with how radio equipment



Nyrods are a slick and easy way to convey servo movement to control surfaces, but there are some considerations to remember!

DU~BRO TRU~SPIN KEEPS YOU IN BALANCE!

BALANCES:

- AIRPLANE PROPS- ALL SIZES
- JET FANS
- BOAT PROPS
- HELICOPTER ROTOR HEADS
- SPINNERS
- CAR WHEELS AND MOTOR GEARS

functions? Inside that small box is an amplifier that builds the signal it receives to the strength necessary to drive an electric motor, which provides the actual movement. The motor is connected through a series of gears to the output arm, as well as to a circuit that tells the motor when it has moved in the right direction and when it has moved as far as it was told to by the transmitter. There's a lot of good things in that small package, and everyone can use an extra servo to replace the one that has finally worked its way to throttle duty!

The next picture is an example of what the servos move! The connection of flight surfaces to the servos is usually based on the pushrod, and in this case, a flexible rod within a sheath. Alternate materials, such as music wire, cable, or fluted nylon are frequently used as the pushrod, but they still run in a conduit for direction control. The pushrod exit is above the elevator to ensure full servo strength (in a pull direction) for up elevator. Since this type of pushrod can flex when it encounters too much resistance to the "push" part of its function, the sheath should be anchored at several points within the fuselage. It's always a good idea to use this type of linkage so that it pulls the critical control in the critical direction.

There are many things that experienced modelers do in the course of building an airplane. Some of these things are so automatic that the builder isn't even aware of why they're done. The trick is to do them for the right reason the first time, then automatically thereafter!

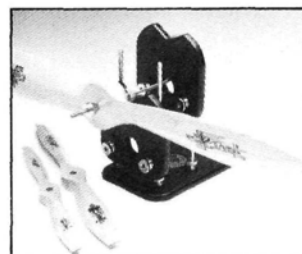
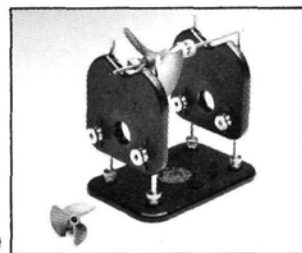
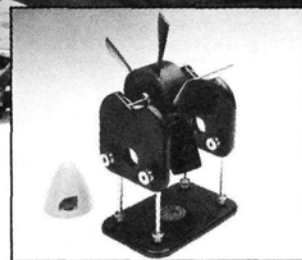
Just remember that everything that has ever been manufactured existed first as a thought, then as a hand-built model, before it was ever refined into production. If you can think of it, you *can* build it, and no one can do it better than you!

**Here are the addresses of the companies mentioned in this article:*
Ace R/C Inc., P.O. Box 511 Higginsville, MO 64037.
Heath Co., Benton Harbor, MI 49022. ■



FEATURES:

- Specially designed locking cone securely centers and locks props onto the balancing shaft for utmost accuracy.
- Quick and easy to assemble.
- Universal - Designed to balance all the items listed above without any special accessories.
- Strong, stable and durable - the balancing wheels are recessed to prevent damage if accidentally dropped.
- Du-Bro's Tru-Spin prop balancer is adjustable vertically and horizontally to conform to any balancing need.
- Truly a precision instrument built for modelers who expect the very best.
- Available now at your local hobby shop.



DU-BRO PRODUCTS, INC
480 Bonner Road • Wauconda, IL 60084

For model
builders and
Mustang
lovers ...
one you can
wear!



by BUDD DAVISSON



5151

WE WERE HIGH at his 7 o'clock position—so close I could have spit on his stabilizer. The characteristic belly scoop reflected the light as we turned down-sun, and I had to laugh as the Mustang's pilot turned to look back at us as if we were a

Messerschmitt about to have him for lunch.

Then I looked at our air-speed indicator. It read 70mph! Wait a minute! At that speed, a Mustang is either taxiing out to the runway or is in the final stages of mak-

MUSTANG



Left to right: On a low pass, the 5151 could easily be mistaken for a model.

How's this for an airfoil most modelers recognize and have probably used?

Structurally, the lightweight Mustang resembles a "stick-and-tissue" model.

Outer wing panel builds up easily. Spars, leading-edge sheeting and ply ribs with lightening holes are familiar components.

PHOTOS BY LOEHLE AVIATION, INC.

ing a big, smokey hole in the ground. Still, that's all our Citabria camera plane showed. Cocking an ear to the open door, we could hear the Mustang ahead, and instead of the magnum sound of 12 stacks barking away, we heard the unmistakable buzz/chatter of a chain saw, or perhaps a super-Quadra. This *wasn't* your average Mustang!

We talk about it all the time: how models are either *increasing* in scale to match full-size airplanes, or the real ones are *decreasing* to match the models.

This particular Mustang—the 5151 from Loehle Aviation*—is where the two “curves” cross. In every possible way, this is a model airplane. The structure is model airplane; the 2-stroke engine (Rotax 503, 48 horses) is model airplane; even the caricature lines are sport-scale model airplane. Only the 1:1-scale pilot *isn't* model airplane. It's not necessary to feed a Williams pilot, no matter what the scale or detailing. That's all that separates this machine from being a giant-scale model: The pilot replaces the receiver,

(Continued on page 35)

5151 MUSTANG

servos and battery pack. And no; to answer the next question, there are no plans available to replace the pilot with the aforementioned onboard electronics!

The 5151 is the creation of Mike (the son) and Carl (the father) Loehle. Mike has been an integral part of the ultralight airplane movement for years, starting back when they were foot-launched biplane lawn chairs and progressing up through the more airplane-like models we see today. He got into the manufacturing of ultralight propellers with a partner who was later tragically killed. This left Mike with a thriving business, lots of machinery and a runaway imagination that has always been central to the true entrepreneur.

As the ultralight movement faded, many designers began to think in terms of taking the best parts of the ultralight movement and applying them to machines that more closely resembled real airplanes. This gave rise to the machines now known as ARVs (Aerial Recreational Vehicles). These are true airplanes, but they retain the 2-stroke engines the ultralight field did so much to help develop. To fly on those engines (the largest of which is still only 60hp—most being in the 40 to 50hp range), meant the airplanes still had to be very light and have lots of lifting surface. Most of the machines fell into two categories: those using conventional welded-tube-and-fabric structure and those utilizing the pop-riveted and bolted-aluminum tubing of the ultralights. The Avid Flyer/Kit Fox are representative of the former, and the Rans series demonstrates the latter.

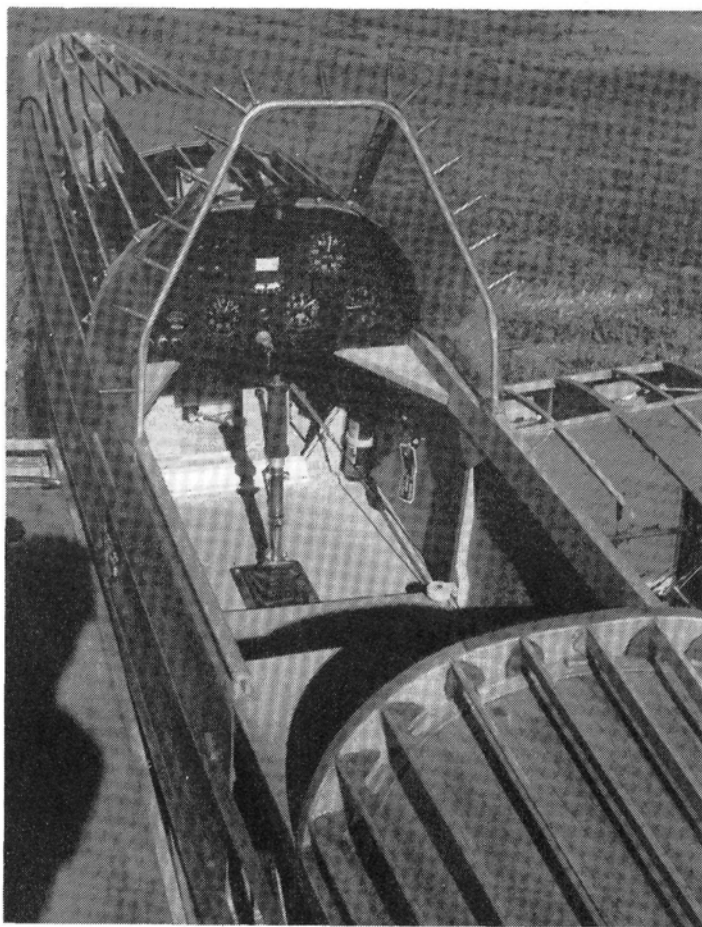
But Mike Loehle was thinking in other directions. Like all pilots, he'd like to fly a P-51 Mustang; but—again like most pilots—he'd prefer not to have to cope with the cost, maintenance, expense, hot performance, money involved, hangar and the crushing financial burden that comes with the airplane. He wanted a *low-buck* Mustang he could both fly and afford easily, and he figured the rest of the world did, too. This is a formidable objective that has been approached by many home-builder designers, but never with any notable success. The Mustang is one of those airplanes that looks great 1:1, but as the scale comes down, the problems don't go away. Just finding a suitable engine to put in

an in-line cowling has brought most projects to a less-than-satisfactory conclusion—or a screeching halt!

Loehle, however, had another vision. Coming out of ultralight aviation, he was weight-phobic. Since ultralights had

to stay under 254 pounds to be legally exempt from FAA registration, anything having to do with weight was “examined with a magnifying glass” to see if it could be made lighter; and that was how he was going to build his Mustang. It would use the Rotax 48-horse 2-stroke that has done so much to change people's minds about that type of engine, and this would allow the in-line cowling to flow uninterrupted. Then, the structure would be *super-light* and thoroughly “buildable”—which sounds easy, but isn't.

Mike then dumped the problem in his dad's lap. Carl Loehle is one of those renaissance individuals who has done *everything* having to do with nuts and bolts, and what he can't engineer, his friends can. According to Mike, he's also a long-time model builder, and his experience includes a lot of free-flight experience, where he also



Close-up of structure and cockpit layout shows simple, easy-to-duplicate assemblies. How about an *exact* 1/4-scale version?

became a “weightaphobic.”

The final structure, which is the result of the efforts of many engineers, a lot of Mike/Carl arguments and many static tests, is truly inspired, and although it looks unconventional, it's actually rooted in 80 years of similar structures.

The chosen material is wood, which has the advantage of being easy to use by almost anybody in any situation. It also dampens vibration (something necessary with the 2-stroke engine) and is easily formed into kits. The fuselage uses a plywood box for the forward section, with stringers giving the desired shape. The aft fuselage is basically a geodetic layout, where the longerons are joined by a lattice-work of thin strips oriented at 45 degrees, the primary direction of stress flow. To make it easy for the builders, the longerons have slots cut in them to accept the lattice strips.

The wing center section (out to the main gear) uses a plywood box spar that handles the torque loads imposed by the landing gear. The outer wing panels are one of the neatest parts of the airplane. Designing extremely light wings that require no wires or braces ain't easy. The term “light

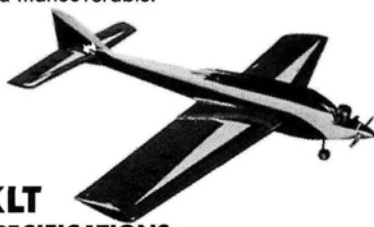
More Fun. Less Funds!



ESCAPE SPECIFICATIONS:

Wing Span 62½ inches
Wing Area 770 square inches
Engine Size 10 cc
90 or 120 four stroke

Designed for AMA for the FAI Turn-around pattern. Foam wing and stab with 3-32 Balsa sheet covering. Tricycle or conventional gear, fixed or retracts. Rear or side exhaust, fiber glass canopy. Very positive and maneuverable.



XLT SPECIFICATIONS:

Wing Span 65 inches
Length 65 inches
Wing Area 845 square inches
Recommended Engine Size 10 cc
90, or 120 four stroke

The XLT is designed for tuned pipe and retract landing gears. Capable of the A.M.A. or Turn-around pattern. Rear or side exhaust.



UTTER CHAOS

SPECIFICATIONS:

Wing Span 63¾ inches
Wing Area 700 square inches
Engine Size .50-.60 (Glow)
.90 four stroke

For fun, sport, pattern, or turn-around, all of these can be done with the Utter Chaos' completely built up Balsa construction. Canopy and engine mount included. Many years of proven flying reliability.

BRIDI AIRCRAFT DESIGNS, INC.

23625 Pineforest Lane
Harbor City, California 90710
(213) 549-8264 • (213) 326-5013

SEE YOUR FAVORITE
HOBBY SHOP OR
RETAIL OUTLET



Dealer Inquiries Invited

5151 MUSTANG

and simple" and the word "cantilever" are usually mutually exclusive; you can have one, but not both. The problem incurred by not having any external bracing is that the wing panels have to resist bending loads as well as torsion loads. The solution developed by the Loehles is really neat and shows some imagination.

The main spar is actually two spars that form a box in which the faces, top

now forbid its use because of the inexplicable times when a joint doesn't kick off.

Because the weight of the empty airplane is 400 pounds and it goes faster than 55mph (100mph is tops, and cruise is 75 to 80mph), the FAA requires that the airplane be licensed as a home-built airplane. This means the pilot must have *at least* a student pilot's license and be signed off by an instructor for soloing in this type of

"Here's a real, live airplane that can be completed in about the same time it takes to do a fairly decent scale ship."

and bottoms are geodetic latticeworks. The spar box is almost identical in concept to the aft fuselage in that the spar caps form the corner of the box and the lattices take up both the upward and downward bending moments and the fore and aft drag/anti-drag forces, and the entire box resists the torsion. The plywood ribs are simply glued to the front and back of the box to streamline it and connect the rear spar, which hangs the ailerons.

At first glance, this type of structure looks complicated because there are so many little pieces going six ways from Sunday. However, any model builder worth his salt can look at it and realize immediately how quickly it will progress. There are a lot of pieces, but they aren't complicated, and those that are tough to build are finished at the factory. The laminated spar caps, for instance, are ready to go with the right amount of dihedral already dialed-in. In fact, the factory kits take the FAA's 51-percent rule (that much has to be done by the builder) and use it as a guideline, giving the builder a really well-thought-out, prefabricated kit. Some thought has also been given to follow-on operating costs, because the wings detach easily to allow the plane to be transported in an 8-foot-wide trailer.

Incidentally, the primary adhesive used is T-88 epoxy, which is a slow-setting marine glue now marketed in aviation. We asked Mike about the use of CA, and he said they had "played" with it, but

airplane.

The complete kit, including the engine, but not including the retractable-gear option, costs \$7,282. (The retracts add \$1,500.) The time logs kept by several builders show the machine can be completely finished in less than 500 hours.

Now is a good time to reflect on what I've just said. Here's a real, *live* airplane that can be completed in about the same time it takes to do a fairly decent scale ship. Never mind the award-winning models; those can easily devour 1,500 hours. Yes, the 5151 is more expensive than a normal model, but put together a couple of top-dog Byrons or Yellow Aircraft Tomcats and the final bill is back up there again.

Since the airplane is really nothing but a Cub in warbird clothing, it would make an excellent collaborative project for a couple of non-pilot model builders. They could then go out to the closest flight school that offers tail-wheel training (not as easy as it sounds), get 30 hours or so of flight time (10 to solo, the rest to practice) and be ready for the 5151.

Of course, a large R/C club could build a couple of them for formation flights, and there are only 16 airplanes to a squadron, so they could hook up with other clubs and ...

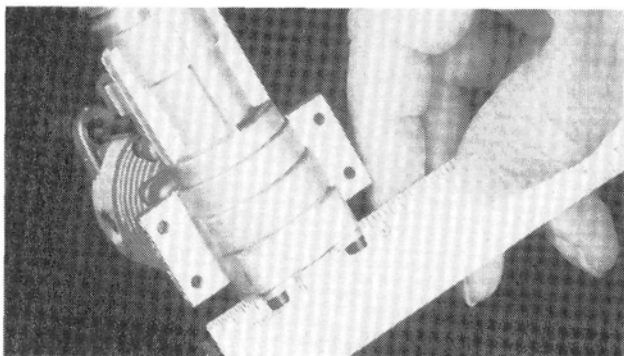
*Here's the address of the company featured in this article:
Loehle Aviation, Shipmans Creek Rd., Wartrace, TN 37183.

How To:

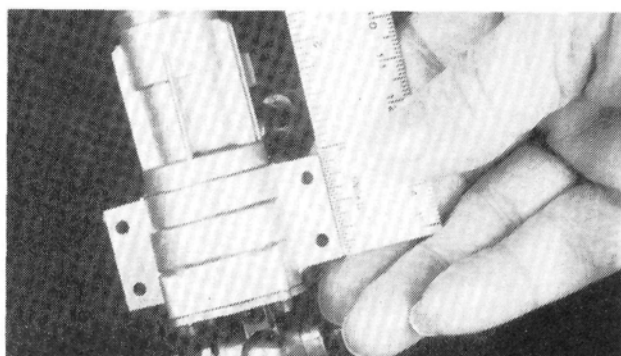
by RANDY RANDOLPH

MAKE AN ENGINE DRILL JIG

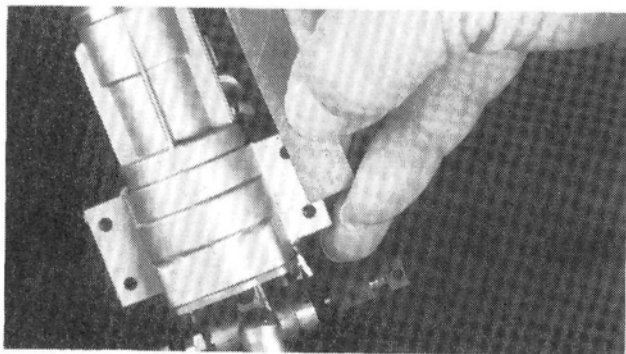
One of the more frustrating chores of mounting an engine on a new mount is drilling the mounting holes. The photos show how to make a drilling jig that will make the job much easier and more accurate.



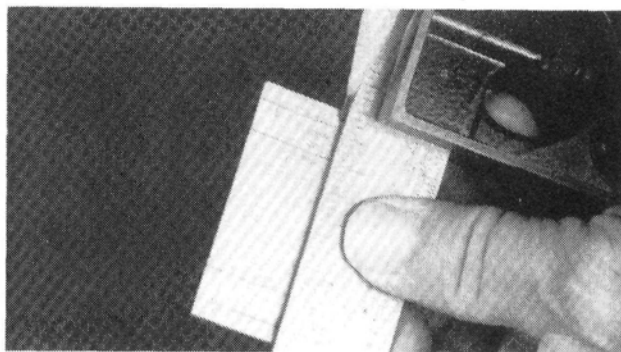
1. Carefully measure the distance between the mounting holes and the width of the crankcase at the beam mounting flanges, as well as the overall width of the flanges.



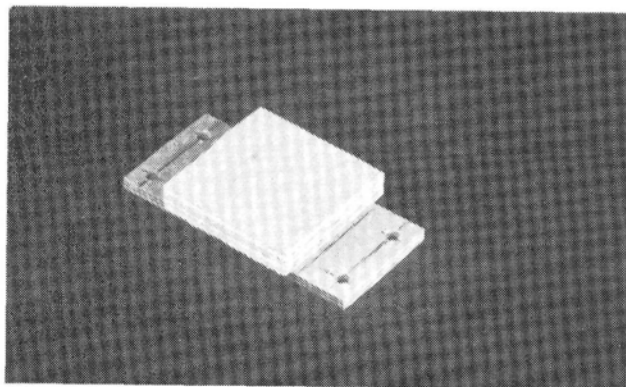
2. Measure the depth of the mounting flanges from the front edge to the back edge. If several engines are measured and the measurements recorded, more than one jig can be made at the same time.



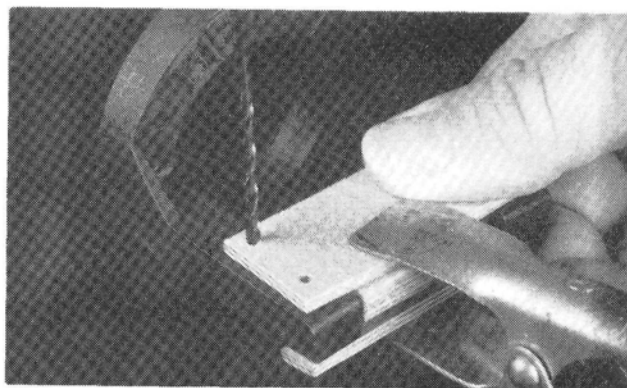
3. Measure the distance between the mounting holes in each flange and the distance between the holes across the case. These are the critical measurements, so they must be accurate. Measure from corresponding sides of the holes rather than from their centers.



4. Cut a piece of $1/8$ - or $3/16$ -inch plywood to the same size as the outside measurements of the mounting flanges. Use a square to mark the locations of the mounting holes and the crankcase on the plywood. Drill the mounting holes using a $3/32$ -inch drill, and a drill press if one is available.



5. Cut a piece of $1/4$ -inch plywood to the same size as the crankcase width measurement and glue it in the place marked on the plywood flange. This must be done accurately to ensure proper hole alignment.



6. Hold the jig in position on the mount just as the engine is to be mounted (a spring clamp and scrap wood work great). Drill the holes in the mount with a $3/32$ -inch drill; then remove the jig and enlarge the holes if necessary.



TOP GUN

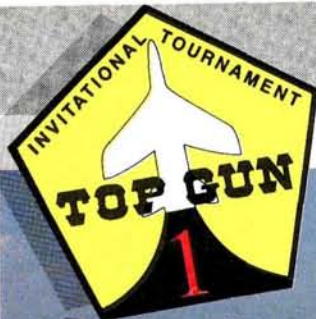
1989

by RICH URAVITCH

IT WAS JUST ABOUT a year ago this time when the letter arrived. Emblazoned with a flashy insignia, it would not be ignored. It raised my interest enough to save it from the "circular file," which is the usual repository for all correspondence whose source I don't readily recognize.

"Dear Rich: A great deal of rumor about a new Scale R/C Championship for the upper-level fliers has been circulating. Well, it's absolutely true, and we're pleased to inform you that you're one of the 40 modelers to receive an invitation to this Championship ..."

After checking out the validity of the invitation and finding it legitimate, I wondered why anyone would have to be notified about a competition a year in advance. Surely, anyone who



The mechanical portion of the "Top Gun" winning team, Bob Fiorenze's twin Dynamax-powered F/A-18.

was already active enough in R/C scale modeling to be recognized and invited would never need that kind of time to prepare! Well, *nearly* anyone. My Robart radial-powered Zirolti T-6 remained home, not quite finished, while I attended the first-ever Top Gun Invitational Tournament—as a spectator rather than as a participant! Here's the way it went:

The Top Gun Tournament was conceived and, for the most part, executed by Frank Tiano, a name familiar to regular readers of our "Sporty Scale" column. Frank is also the owner of FTE, which is the source for every bottle of ZAP and related Pacer product on the East Coast. All this involvement with modelers (and the industry in general) convinced Frank that the scale world was more than ready for an event like Top Gun, so he embarked on a course to make it happen.

The goal was relatively simple: Invite some of the best scale builders and fliers in the country to a high-stakes "shootout" in Florida to determine who would be the "Top Gun." To accomplish this objective, it was necessary to establish a committee that would select the participants and judges based on some clearly defined guidelines; develop a set of rules that were stringent, yet as fair as possible; give them to the contestants in sufficient time to eliminate most of the questions; get the support of as many groups and sponsors as possible; pray for good weather; and hope! It all came together on April 21, when 39 of the country's best gathered in Coral Springs, FL, to do battle!

All the static judging took place on Friday, and each con-



Could this Brit be confused? He's holding a German Focke Wulf, wearing a Japanese headband and is competing in a Yank contest. Dave Platt participated in the International Dogfighting Association show.



1 Ted White did some spectacular demo flying with his Byron-based P-47. He competed with the same airplane. **2** As close as you care to come! Chuck Fuller's Ryan overflies Wayne Siewart's Mooney/Porsche. **3** Bob "Top Gun" Fiorenze's impeccable F/A-18 Hornet just about ready to lift off. **4** Wayne Siewart's fully detailed Mooney Porsche is one of two that he flies. A kit is available. **5** High-flying cars or low-flying airplanes? Both! Florida AMA show team conducted lunch-time "races." **6** High State Award of the meet went to the Grand Master, Dave Platt, for his superb A6M2 Mitsubishi Type 0.

testant had a specific time slot in which to present his airplane to the judges. Three judging positions, each manned by a pair of judges, enabled this portion of the competition to move along rapidly. The weather couldn't have been better, and since there was no flying going on (although trim-flight time was available for anyone who requested it), I had a perfect opportunity to wander around the flight line and do some hangar flying (in addition to fending off the abuses of some of the competitors, who took the opportunity to remind me of how typical it was of me to show up *without* an airplane!). The quality of most of the models on hand was outstanding. Many were veterans that I'd seen before at Scale Masters competitions, but others were brand-new airplanes, built especially for this event. The variety of subjects was amazing; everything from Jeff Troy's lazy-flying,

1/3-scale Bleriot to Bob Fiorenze's twin-fan-powered F/A-18 Hornet.

Attending a meet of this significance, especially when its fo-



Tom Street absolutely dazzled the crowd with the routine he flew with his 4-stroke-powered B-17. It's rock solid and very stable.



This Staggerwing Beech was one of two in the competition. This one by Mel Santmyers started life as a Byron kit and uses an O.S. 240 trim for power.



7 The Spitfire Mk.IX of Brian O'Meara was built from the Platt kit and hauled around by a S.T. 3000. **8** About the only thing that would have made Dee Lopez's simulated ditching more realistic would have been if the blacktop were the Pacific Ocean. **9** Heading for the Channel and the white cliffs of Dover is John Guenther's Spit Mk.IX. **10** A .10-powered Mustang, Spitfire and Focke Wulf 190 duel it out in the sunny skies of Florida. (International Dogfighting Association demo.) **11** Tail-high on the takeoff roll is Bill McCallie's FW-190D-9. Belly tank is "jettisonable." **12** A pair of Hornets—twins. Dan Parson's deHavilland (left) and Bob Fiorenze's McDonnell Douglas (right). **13** Mike Mas' aerobatic presentation with his XCell heli brought new meaning to the term "hot-dogging."

cus is scale, offers the opportunity to learn a lot about how other modelers do things—how they build, cover, finish, detail and fly. It also makes you keenly aware of just how important a role preparation and practice play in where you end up when the scores are tallied. Here are some interesting bits of information: For all you guys who think a military airplane *always* has an advantage over a civilian bird in scale competition, Dave Platt posted the high static score with his Zero at 91.14, while Steve Sauger and Charlie Nelson, with an Aeronca Sedan and a VKS Waco, respectively, each garnered 90.21 points—less than a point behind. "Conventional-size" airplanes (60- to 70-inch span) can still compete on an even plane with some of the larger, or even "giant," machines, as evidenced by 8th-place Bob Frey with his "smallish" 62-inch P-47 Thunderbolt. Sure, he flew it extremely well; has for years, but so what? It came in ahead of 31 other tough competitors, that's what! Well, actually ahead of 23 other tough competitors, if you consider attrition, which accounted for a loss of 20 percent of the airplanes on hand.

Eight beautiful pieces of work bit the dust, and this has to rank it right up there with Christie Brinkley's wedding an-



You can almost hear the clackety-clack of the OX-5 valve train in Dick Hansen's beautiful JN4D Jenny.

nouncement in "heartbreak factor." Among the casualties was Mike Kulczyk's beautiful F-105D Thunderchief, whose engine decided to head south when he was farthest away from the runway. Mike elected to land gear-up on the grass and looked like he had it made, except for a berm alongside a ditch that slowed the Thud from 50mph to zero in an instant, throwing parts at least 50 feet forward of the impact point. After the initial shock wore off, Mike seemed convinced (after nearly everyone told him that the airplane *needed* to be rebuilt) that there would indeed be another "Nickle" around. The "Critics Choice Award" (a new 1024 Futaba radio) might have removed some of Mike's unhappiness, and it will undoubtedly find a happy home in

his next project, which we now understand might be a BD-10.

Other models sharing this unfortunate fate were Jeff Troy's Bleriot, Frankie T's P-39 Airacobra, Shailesh Patel's F6F Hellcat and a magnificent Hawker Sea Fury from north of the border by our Canadian friend Gerry Fingler. Gerry augered in from about 400 feet after his wing folded. Former U.S. Scale Team member George Rose lost his super Curtiss P-6E Hawk early on, much to the disappointment of the many spectators. (The Hawk



TOP GUN STANDINGS

| Finish | Pilot | Airplane | Total |
|--------------------------------------|------------------|------------------------|--------|
| 1 | Bob Fiorenze | F/A-18 Hornet | 183.26 |
| 2 | Neil Snodgrass | Midwing Special | 175.15 |
| 3 | Skip Mast | C-130 | 174.84 |
| 4 | Cliff Tacie | Savoia-Marchetti SM81 | 174.69 |
| 5 | Chuck Fuller | Ryan PT-22 | 174.66 |
| 6 | Dick Hansen | JN4D Jenny | 173.67 |
| 7 | Charlie Nelson | Waco VKS-7F | 172.84 |
| 8 | Bob Frey | P-47D Thunderbolt | 172.64 |
| 9 | Bob Violett | F-86F Sabre | 172.55 |
| 10 | Jeff Foley | A6M32 Zero | 171.31 |
| 11 | Shailesh Patel | F6F Hellcat | 170.20 |
| 12 | Dave Platt | A6M2 Zero | 170.02 |
| 13 | Bill McCallie | FW-190D-9 | 169.03 |
| 14 | Don Snull | Eindekker E-III | 167.58 |
| 15 | Bob Heitkamp | JU-87G-2 Stuka | 167.24 |
| 16 | Diego Lopez | F6F Hellcat | 167.12 |
| 17 | Bob Underwood | Petlyakov PE-2 | 165.62 |
| 18 | Shane Cramer | P-47D Thunderbolt | 165.23 |
| 19 | Jack Buckley | CAP-10B | 164.19 |
| 20 | Bob Hanft | Neuport 28C-1 | 163.21 |
| 21 | Ted White | P-47D Thunderbolt | 162.87 |
| 22 | Steve Sauger | Aeronca Sedan | 162.71 |
| 23 | Mel Santmeyers | Beech Staggerwing G-17 | 162.45 |
| 24 | Wayne Siewert | Mooney Porsche M20K | 161.19 |
| 25 | Brian O'Meara | Spitfire MK XIV | 161.19 |
| 26 | Tom Czikk | P-40C Tomahawk | 159.25 |
| 27 | Dan Parsons | DeHavilland Hornet | 158.17 |
| 28 | Charlie Chambers | P-51D Mustang | 157.27 |
| 29 | Bill Carper | P-47D Thunderbolt | 157.22 |
| 30 | Chuck Collier | Beech Staggerwing | 155.23 |
| 31 | John Guenther | Spitfire MK-IX | 153.34 |
| 32 | Tom Street | Boeing B-17G | 152.59 |
| 33 | Mike Kulczyk | F-105D Thunderchief | 109.32 |
| 34 | Jeff Troy | Bleriot XI-2 | 93.15 |
| 35 | Art Johnson | B-26 Marauder | 93.10 |
| 36 | George Rose | P-6E Hawk | 88.73 |
| 37 | Gerry Fingler | Hawker Sea Fury MK II | 88.68 |
| 38 | Frank Tiano | P-39L Airacobra | 84.84 |
| 39 | Mario Yederlinic | Hurricane MK IIC | 83.06 |
| Critics Choice Mike Kulczyk | | | |
| Pilots Choice (Military) Bob Violett | | | |
| (Civilian) Steve Sauger | | | |
| High Flight Score Bob Fiorenze | | | |
| High Static Score Dave Platt | | | |

Frank Tiano's Bell P-39 Airacobra fell victim to at least one anti-gravity occurrence... careened into the fence shortly after takeoff. Frank says he'll do another.

was truly a precision scale model.) Art Johnson's 4-stroke-powered Martin B-26 Marauder appeared to lose power from one engine on takeoff; Art tried to get it level again, but to no avail. Rounding out the list was Charlie Chamber's metal-clad P-51 Mustang, which, like all the entries, had to be seen to be believed. There's probably no real way of accurately assessing the number of man-hours that ended up in the junk pile at this meet, but when you're competing at this level, it's the risk you take.

While the contest was in progress, it became readily apparent that it had been very well planned. Unlike other events where the lunch break finds a decided lull in flying activity, this one featured some of the best R/C demonstration flying to be witnessed anywhere. Everything from .15-powered Mustangs, Spits and Focke Wulfs (designed to be expendable) doing combat with the *intent* of knocking each



Bob Violett's F-86 sheds its drop tanks as it crosses an imaginary Yalu River in search of Migs.

WHAT'S A TOP GUN?

In the strictest and, by the way, original, sense of the word (or at least the one that put the term on the street, so to speak), it's Ultimo, Head Man, Ganze Mache, Top o' the Heap. It's the exalted title that the Navy bestows on the hot-stick crews that "best" all their peers in aerial gun-fights that would cause mere mortals to seek milder forms of competition—checkers, maybe! These are the guys who speak with God on a daily basis, or at least have a handle on His address. No foolin'! The games these guys win are played with no "shoo-ins," no gifts, they're strategized, exercised and fantasized, where the name of the game is WIN! Prepare for the mission, compete as a team, fly at the edge, and use the next guy's mistakes to your advantage.

Is it any wonder why the name "Top Gun Invitational" was chosen for this new event in the world of R/C scale modeling? All the requirements are the



Rich Uravitch presents 1st Place cash award of \$2,000 from MODEL AIRPLANE NEWS to the 1989 Top Gun, Bob Fiorenze. Bob's "co-sponsor," Ann, might redirect some of the winnings!

same; the competition, in its own way, is as fierce. The ingredients are also the same: planes, pilots, ground crews, mission, judges and scores. This was the first year for this competition, and indications are that it has all the necessary qualities to become an annual occurrence. Model Airplane News was proud to be a major sponsor and offers its congratulations to all the competitors—especially to Bob Fiorenze, scale Top Gun, 1989. RAU

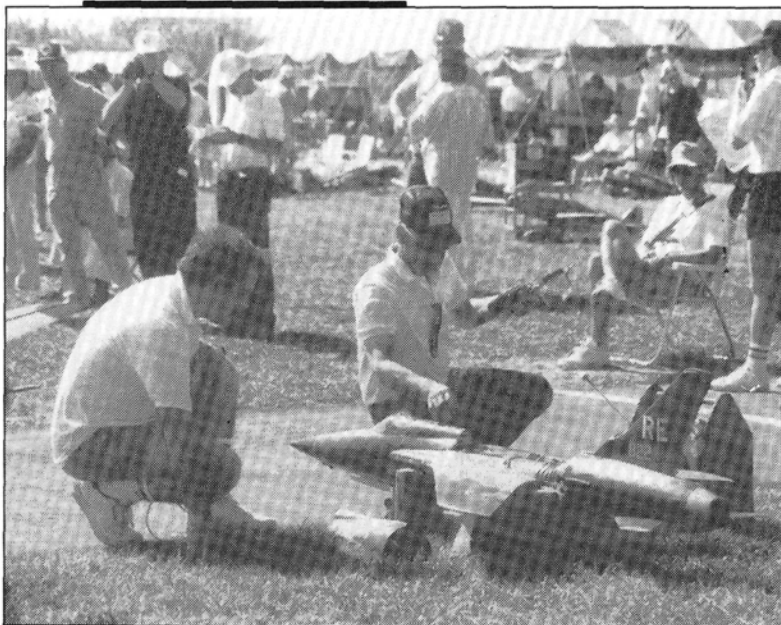
Chuck Fuller flew his "MonoKoted" (fuselage anyway) Ryan PT-22 impressively. Smoke added to the appeal.

other out of the sky, to Mike Mas' helicopter artistry; from Chuck Fuller doing low-level aerobatics with a Sig Space-walker, to Skip Mast using his contest entry C-130 Hercules to perform loops and rolls; and Ted White using his contest entry Byron P-47 in a display of maneuvers that would have made any Jug driver proud. One flier *not* using his entry for the demos was Bob Violet, who chose to leave his F-86 in the hangar during lunch to fly his Viper, once again pleasing the crowd with the broad speed envelope of this ducted-fan rocket. And then there was the Florida AMA Show Team, which treated all of us to a Grand Prix-type air/road race. Art Johnson traded his B-26 in on a Ferrari and "raced" around an airborne "track" against a pair of similar flying cars. The crowd loved it.

Special mention has to be given to one of the Cloud Dancers' Show Team members, Don Muddiman, who did things with

his airplane that I still don't believe! A lot of you might have seen this performance, as the Cloud Dancers have appeared at many R/C events around the country, but it was the first time for me. I had been told,

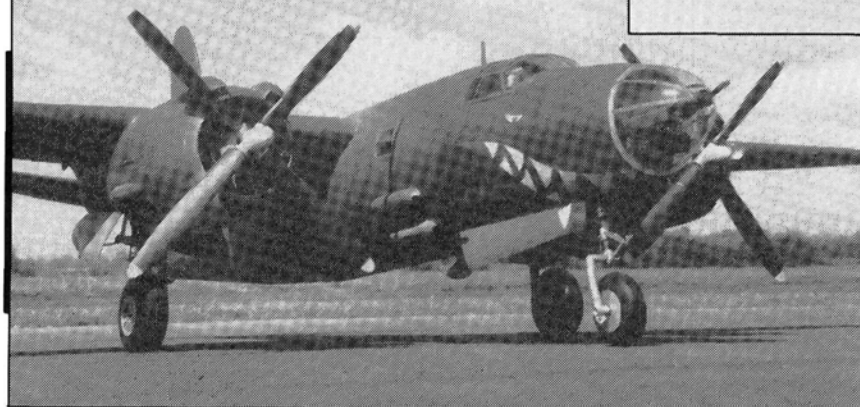
just as I can tell you, but you have to see it! Don starts with a vertical hand-launch and concludes with a vertical dive from about 1,000 feet to a dead-stick pull-out at about 10 feet to a couple of rolls end-



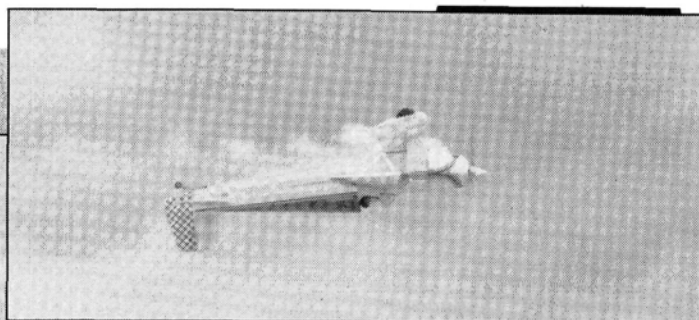
Mike Kulczyk on the ready line with his F-105D Thunderchief. Rumor was that helper on the left contributed to subsequent crash owing to inadequate calling! Mike received well-deserved "Critics Choice" from fellow competitors.



One of my favorites was the Hawker Sea Fury built by Canadian scale ace, Gerry Fingler. Superb finish! Wing folding at a non-scale location caused it to smite the earth ... with much energy!



Above: Art Johnson's Martin B-26 Marauder was O.S. .90 4-stroke-powered and was a beautiful piece of work. Crashed on takeoff.



Inverted on a smoke pass, here's the Midwing Special designed and built by 2nd-place finisher, Neil Snodgrass. Proves that well-flown, relatively simple subjects can still be very competitive.

pleted, is when the contestants get down to business. They know where they stand and what they'll have to do to remain in the running. Top Gun was no exception. Strategies were developed, and the toughest competitors prepared for the battle ahead. This was one contest where every fraction of a point would count, and could even mean the difference between winning and just finishing. Each pilot chose his maneuvers, options and sequencing carefully, because they recognized that

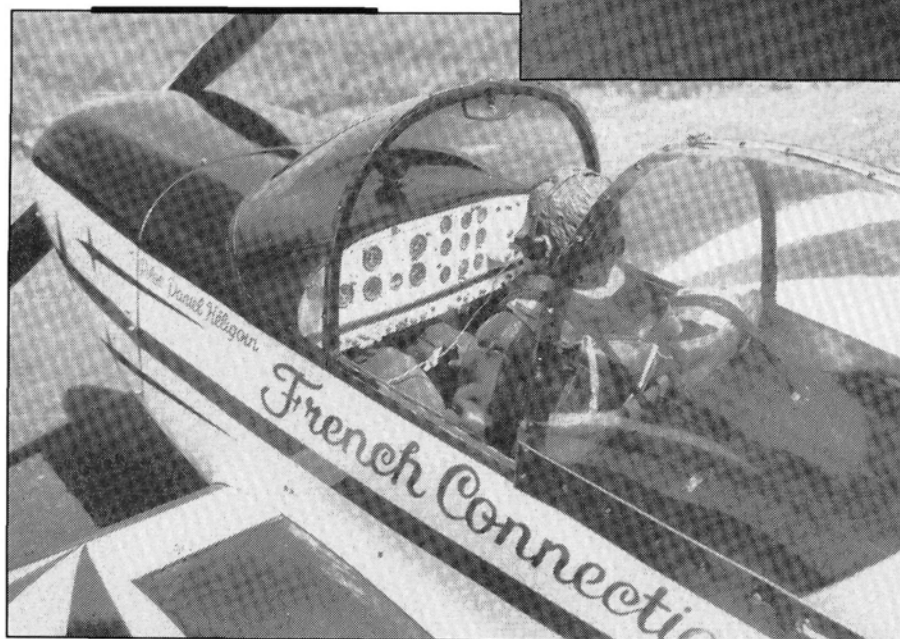
ing with a feather-like touchdown at Don's feet. Truly spectacular!

Generally speaking, the posting of the static scores, which usually occurs after the first round of flying has been com-

Below: Cockpit detail of Jack Buckley's CAP-10B modified from the Yellow Aircraft kit clearly shows the amount of detail that's typical of the models at "Top Gun."



Above: Close-up of left main landing gear of the Firenze Hornet. This all works! Individual gear doors are sequenced to operate in the scale fashion.



not much, if anything, would escape the eyes of the judges.

Tom Street literally re-enacted the full-scale Confederate Air Force show, in which their B-17 makes an emergency touchdown on one gear with one engine shut down and smoking. If Tom's static score had been better, he would, no doubt, have placed much higher. During aerobatic routines, smoke was used to good advantage by both Chuck Fuller in his Ryan PT-22 and Neil Snodgrass with his Midwing Special. Yet another use for smoke was found by Bob Heitkamp, who

came all the way from Alaska to fly his cannon-equipped Ju-87G2 Stuka, which simulated a tank-busting run by emitting smoke from its twin cannons.

Every detail mattered: preparation, concentration—everything! After four rounds of flying, the smoke finally cleared and the final scores were tallied. The battle was over. The 1989 Top Gun title had been decided; not easily, but after a hard-fought competition. The winner? Bob Fiorenze, with his outstanding McDonnell Douglas F/A-18 Hornet. This represents something of a repeat performance for Bob, as he also won the 1988 Scale Masters competition. If you want to get a better feel for what it takes to win repeatedly, I suggest you read our interview with Bob in the January '89 issue of *MAN*; here's a guy who apparently *does* exactly what he *says* he does ... consistently!

Earlier in this coverage, I mentioned that some interesting information came out of this contest. Here's another bit: As awesome and overwhelming as Fiorenze's F/A-18 might appear (even to the point of intimidating some of you who might be considering getting into R/C scale), let's take a look at the guy who finished in 2nd place, right behind Bob. Neil Snodgrass' static score was less than 1/5 of a point behind Bob's. His entry, a Midwing Special, duplicated a home-built that started life as a Piper Super Cruiser. Imagine! A simple, rivetless, fixed-gear, rag-covered airplane! Executed with painstaking care, this model serves as living proof that even "uncomplicated," non-military subjects can do very well in any form of competition, provided the same effort is put into them.

This event was extremely well organized, from the food concessions right up to the flight line and frequency scheduling. Post-contest discussions with a number of the contestants found them unanimous that the judging (frequently a problem at scale contests) was fair—tough, but fair, which is exactly what one expects at an event of this caliber. Industry support of the event came in the form of generous donations of merchandise from a variety of manufacturers, in addition to cash prizes provided by the three co-sponsors, *Model Airplane News*, Pacer Technology and the Loctite Corporation. All of us here at *MAN* are proud to have been involved in this premier event.

(Continued on page 60)

duke's mixture



You can drive your car anywhere in our country and fill up your gas tank with any brand fuel, and reasonably expect it to perform about the same as any other brand. This is because gasoline refining companies have voluntarily established standards on viscosity, flash point, octane, etc., so that just about any automobile produced will run okay on various manufacturers' fuel.

Unfortunately, this is not true in the model airplane business. Commercial model fuels are sold with a variety of types and quantities of oils, and some measure nitro by weight, some by volume, and some don't seem to measure it at all. The reluctance of a fuel blender to put his ingredients on the can makes me a bit suspicious that he is trying to hide something — or, perhaps, the absence of something. I would like to see each blender of fuel to voluntarily print on his container just what the ingredients are in his fuel so the modeler knows what he is getting. Also, I would like to see the quantities of each ingredient listed by volume.

All model plane fuel uses commercial methanol as its base. It is commonly known as wood alcohol because it was first produced from wood chips. Now, most of it is produced from natural gas, I am told. In any event, methanol, when bought in tank car quantities, is quite reasonable in cost. It is not the alcohol that runs up the cost of model airplane fuel, it is what you put in it and put it in. While alcohol costs less than \$1.00 a gallon, a good oil costs \$6.00 to \$8.00 a gallon, and nitromethane costs \$30.00 to \$35.00 a gallon when purchased in quantities. Under the pressure of competitive pricing, any fuel blender is constantly tempted to use less and less of the high priced ingredients and more and more of the low priced ingredients.

Now, about the ingredients themselves. Methanol is a single chemical, and not a mixture, as gasoline is. The manufacturing plants deliver it 99.9% pure, or better. About the only thing that can happen to the methanol is if it is sloppily handled, it can be contaminated with water. It only takes a few drops of water in a gallon of fuel to produce noticeable flameout tendencies. Likewise, nitromethane is a nearly pure product, and is sold in one grade only. You should note that nitro content by weight will be in the order of 2/3 the quantity as when nitro content is measured by volume. A modern R.C. motor of a 40 size class requires about 22% oil to be well lubricated and to give a good, long life. Larger motors need less oil, percentagewise, than small ones. The reason being that as the size of the motor increases, the displacement goes up as the cube, while the area to be lubricated goes up as the square. Thus, a motor with a 1 1/2" bore would be as well lubricated on a 10% oil mix as one with a 3/4" bore would be with a 20% oil mix. Unfortunately, some manufacturers have been delivering fuel with as little as 12% and 13% oil, and recommending it for 40 size motors. The result of extended use of such a fuel is as you would expect, an abnormal rate of wear in the motor, and on rare occasions, a catastrophic failure.

Over the years a great many different oils have been used in the search for something that works better and costs less than castor oil. The most usual of these are the glycol type synthetic lubricants. The glycols have good lubricating

qualities, but they have one major shortcoming, and that is that they vaporize at somewhere around 500° F to 550° F. Lawn mowers, outboard motors, and the like are never run hard enough so that this is of any significance. But a model airplane motor that is run hard could have a piston and wrist pin temperature in a 700° F range, and because of this, the motor using pure poly-alcaglycol lubricant is almost certain to have catastrophic ring, wrist pin, and upper rod failure. Castor oil is the only oil I know of that will continue to function at 800° F. Synthetic oils of the phosphate ester type also have this shortcoming. Other oils that have been used are soybean oil, fish oil, and modified mineral oils, such as turbine oil. I am sure that there are dozens of other oils that different fuel blenders have tried, and some are using. I would like to point out that lubrication is not the only requirement of the oil. The rusting of the steel parts, such as crankshafts and bearings, is also a consideration. Motors that were run 30 and 40 years ago on a straight castor oil, alcohol, nitromethane mix show little rust. Some motors that have come back for repair have the bearings rusted until they are ruined. I have to believe that this was caused by some sort of a breakdown in some of the synthetic oils or additives used.

Over the years there have been a lot of different additives used in model airplane fuels. Propylene oxide mixes well in fuel, and it only takes 2% or 3% propylene oxide to very materially improve the idling characteristics of a motor. However, the government has determined that propylene oxide is a carcinogen (cancer causing agent). Any blender who now uses propylene oxide is laying himself open to all sorts of lawsuits. Nitroethane is a sister chemical to nitromethane, and while it is not as effective a power additive as nitromethane is, it is very oily, and a very excellent solvent. Nitroethane is a very useful fuel ingredient for motors with an aluminum piston, because it keeps the inside of the motor nice and clean, as well as providing additional lubrication. A motor with an iron piston should not use a fuel containing nitroethane or synthetic oils because they tend to wash away the glaze castor oil puts on these surfaces, giving their long wearing characteristics.

In summary, what I am saying is that I would like to see all the fuel manufacturers list the nitro content by volume, give the oil amount and type in percentages by volume, and identify any other additives used. Smaller motors need larger percentages of oil than large ones. Good, middle of the road figures would be 22% for 40 size and under, 18% for 60 size, and less for larger motors. In order to understand the importance of a good oil in model airplane fuel, I would like to report a conversation I had with a research engineer with one of the large oil companies. He said that an automobile engine that would normally run 100,000 miles on conventional gasoline would do well to run 2,000 or 3,000 miles on pure methanol because methanol had no lubrication value whatever. The challenge in exploring alcohol based fuels for automobiles was to bring up the lubrication value of the alcohol to match gasoline, and it appeared that this could not be done economically. The oil in your fuel is probably the most important factor in how long your model motor serves you.

Happy Flying,

Duke Fox



Manufacturing Company
5305 Towson Avenue
Fort Smith, AR 72901
Phone (501) 646-1656



Jet Blast

by RICH URAVITCH

WELCOME BACK, jet fans! A lot has been happening in the non-propeller world since the "Jet Special" issue of *MAN* a few months back, and it's amazing just how quickly things can back up on you when you're least expecting it. I'll try to get this column back on a more regular schedule, and if I have any volunteers to do an occasional "guest columnist" spot, I'm taking applications right now!

I'll start off with a question from jet fan John Carlson* who's seeking plans or kits manufactured by the now-defunct Knights of the Air, which was formerly located in West Friendship, MD. Specifically, John is interested in both the U-2 and the Grumman F-11F Tiger. They haven't been sold for a while, and I don't know if kits for the Tiger ever saw the light of day, but I do know a number of U-2 kits were shipped. In any case, if you can help John out, drop him a line. It might be interesting to know if any of you ever saw any of these products actually fly. There's a finished F-20 built from one of their kits hanging in my local hobby shop, but I know it has never flown.

There are four new scratch-built projects to talk about this time: two of them have already flown, the other two are under construction or are awaiting flight

testing. One of the two that have already been airborne is presently being sorted out and refined (it's planned as a MAN construction article); it's the unique-looking MiG-37B Stealth Fighter produced by none other than Col. Bob Thacker. The Colonel is certainly no stranger to the fan world, having done a really pretty Saab Viggen a couple of years back. He's been doing an awful lot of engine/fan testing of late, but has still managed to produce this 11-pound Hurricane* fan-powered jet. It appears to have been scaled up from a plastic kit, and it employs all the flat-plate area and angular lines designed to reduce its radar cross section. Spanning 48 inches with an area of 713 squares, the wing loading is a very "liveable" 35 ounces per square foot. For propulsion, the Colonel uses a Picco* 80 fan engine, and he claims that its flying qualities are "steady and very exciting!" We hope to see more of this bird in the future.

Southwest Fan Fly co-CD, Ed Couch had his A-10A Thunderbolt II on static display at that meet last September and said then that it wouldn't be long before it was finished. Well, it wasn't, and it is. Ed chose the early gray/gray scheme of a Myrtle Beach-based bird, rather than the current green/green/gray "European I" finish, which is now sported by all opera-



Col. Bob Thacker seems happy with his rendition of the Soviet equivalent of our F-117A Stealth fighter, the MiG-37. Since no one has seen or even acknowledged the existence of the real article, you can't argue with the documentation!!

tional T-bolts. As you can see from the photos, Ed's model looks terrific, especially with the external tanks fitted. He sent me a video of the first couple of flights, and it looks real—a bit faster than scale, perhaps, but very real! The model weighs 22 pounds dry, ready to fly, and it was built from plans with major modifications incorporated. Ed reports that the operation of the GAU-8A 30mm cannon is simulated by using an Estes model rocket motor, which shoots an approxi-



Ed Couch has finished and flown his twin Turbax'd A-10A. Features simulated firing of 30mm cannon. Scratch-built.



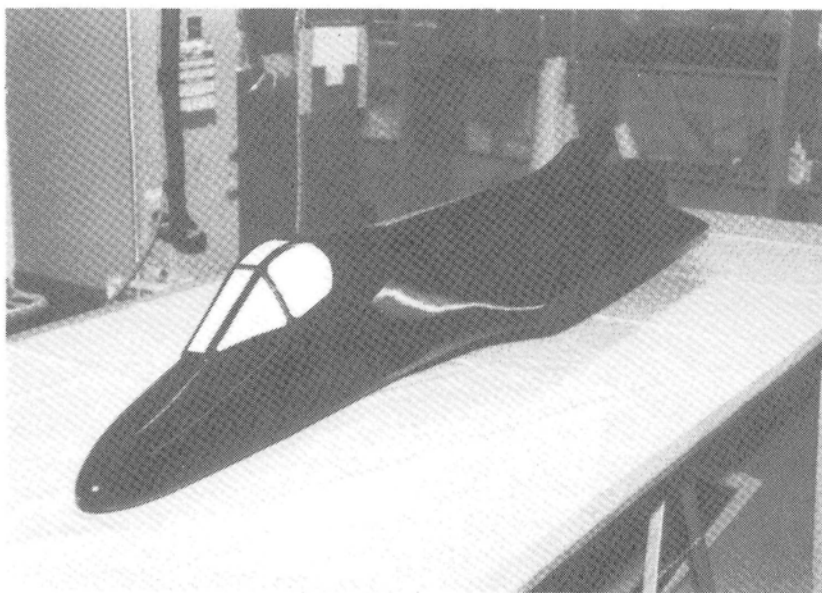
Double Thud. Kurt Wurster's scratch-built F-105D Thunderchief poses with the real article at Wright Patterson AFB near Dayton.

mately 4-foot flame from the nose. Talk about scale "WOW" points!!

Next on the list is another Republic airplane: the F-105 Thunderchief. This one was designed and built by Kurt Wurster of Cincinnati, and it's 1/10 scale. Back in our May '87 issue, we had a picture of Kurt's Zirolì* F-4, which is powered by a Kress* RK-740 fan, and it looks as if he has never stopped working on fan airplanes. His new 105 weighs 12.5 pounds and is powered by an O.S.* .77 turning a Viojett* rotor. The only deviations from scale on this one are the slightly oversize inlets, which Kurt plans to reduce to scale after flight-testing. He's hooked up with a number of other Cincy-based fan nuts who call themselves the "Cincinnati Garage Jets, Inc." Could this be the Midwest version of the infamous Austin bunch? Could a shoot-out be imminent? There's obviously strength in numbers, for just as the Austin group produces some really neat airplanes, so apparently do the CGJI, as they presently have an F-4E, an F-106 and an F-100D in the works. Sounds like teamwork in action!

Does the name Mark Frankel ring a bell? Sure it does! You remember, the Twin Fan Man from Philly! Well, he's at it again with another in a long string of slick, fan-powered airplanes that started with his N.A. A3J-1 Vigilante, went on to a huge Byrojet*-powered Gloster Javelin, and follow this with three versions of a gorgeous Lear 35 powered by a pair of Dynamaxes*. What's next, you ask?

Seems Mark has slacked off a bit and has given up (for the moment, anyway) the complexities of twin-fan operation for the "simplicity" of a single unit. The container for this newfound approach will be a Douglas F4D Skyray, which is probably one of the most graceful, sweeping shapes ever put down on paper. Mark does all his own design, development and fiberglass fabrication, and a beautiful job



F4D Skyray plug currently under way as Mark Frankel's new project. Slated to use 6-inch fan and .90 for power. Future MAN presentation.

he does, as you can see on the photo of the plug for the Skyray prior to making the fuselage molds. We'll try to keep you tuned in to the progress of this slick machine, as Mark has indicated that we can expect a full-blown construction article after everything has been sorted out. At 1/7 scale, it will be big and will use either a Hurricane fan or Byrojet unit driven by one of the hotter .90s. We're looking forward to it, naturally.

Some quick notes from the kit side of the fan scene: Larry Wolfe of Jet Hangar Hobbies* says he will be the sole importer of the beautiful F-15 Eagle with which

Phil Avonds won the World Championships last year. This is a natural fit, as it was designed around the JHH Turbax fan units. Dennis Crooks has his second F-14 Tomcat just about ready—he hopes, in time for the Scale Masters; it's a prototype for the Yellow Aircraft* kit due later this year. Yellow is also feverishly working on a Harrier kit that's scheduled for release in November and an all-new fan

unit, which they claim exceeds the thrust levels of all the presently available units. Lots of work going on north of the border!

Bob Violett is shipping retract units for his beautiful F-86. This now completes the package and allows him to concentrate his efforts on his new F-16C, which should be available toward the end of this year.

Keep those cards, letters and photos coming, and for peak performance...stay tuned!

**Here are the addresses that are pertinent to this article:*

John Carlson, 6415 3rd Ave. S., Richfield, MN 55423.

Hurricane Fans, 14835 Halcourt Ave., Norwalk, CA 90650.

Picco; distributed by Andes Hobbies, P.O. Box 3077, Laguna

Hills, CA 92654.

Nick Zirolì Models, 29 Edgar Dr., Smithtown, NY 11787.

Kress Jets, 4308 Ulster Landing, Saugerties, NY 12477.

O.S.; distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

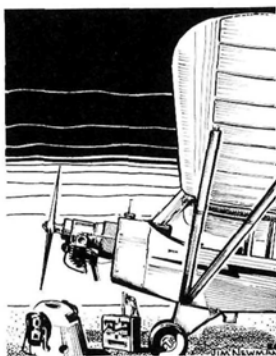
Viojett; distributed by Bob Violett Models, 1373 Citrus Rd., Winter Spring, FL 32708.

Byrojet; distributed by Byron Originals, P.O. Box 279, Ida Grove, IA 51445.

Dynamax; distributed by Jet Model Products, 304 Silvertop, Raymore, MO 64083.

Jet Hangar Hobbies, 12130 G Carson St., Hawaiian Gardens, CA 90716.

Yellow Aircraft & Hobby Supplies Ltd., Suite 201, 3040 Palston Rd., Mississauga, Ontario, Canada L4Y 2Z6. ■



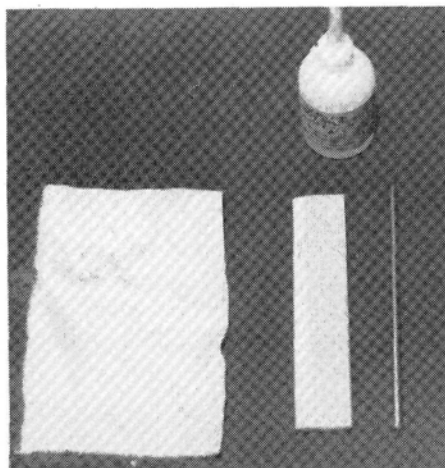
Giant Steps

by DICK PHILLIPS

LAST MONTH, I said I'd discuss some construction ideas in upcoming columns. I've covered a good deal of basic construction in the past, but neat ideas are always coming along, and one that I found particularly useful is a means of attaching strut and landing-gear fairings to wire. Most of the classic and golden age models I build have a wooden fairing attached to the landing-gear wires, cabane struts and wing struts. On full-scale airplanes, fastening these fairings in place is a lot easier than it is at $1/4$ and $1/3$ scale. Using epoxy and the CAs usually works, but they have a bad habit of loosening with time, during any kind of hard use—or just during normal use!

I wanted a more permanent way of attaching these fairings, and I also wanted to provide a means of producing a smooth surface for finishing. If you look at most restored full-scale airplanes using wooden fairings, the darn things are so well finished they're like mirrors. The answer to both of these requirements (permanent attachment and a super surface for finishing) came about after a series of trial-and-error attempts at satisfying the first requirement.

Most regular readers know I favor covering my fabric airplanes with the



Sample ingredients (left to right): Dacron strip slightly longer than strut material; strut material; strut wire.

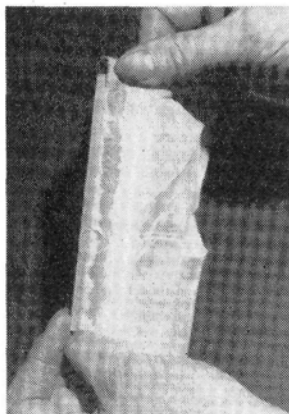
"sleeve" method. I use glider-grade covering material like Ceconite, which I get from Aircraft Spruce & Specialty Co.* in California. When heat is applied, this Dacron-based material shrinks about 25 percent, and it can be made to stick to wood with dope, Balsarite, or a similar adhesive that's also available from AS & S Co. The considerable amount of shrinking possible is the reason I choose it for my fairing-attaching attempts.

I first cut out a small piece of the material: a little wider than the length of the strut to be covered, and long enough to

wrap completely around the strut with a little extra. The slight extra width covers the strut and allows for the shrinkage of the material. Then I glue the material to the back of the strut, using one of the thin CAs. As is apparent in the photo, a narrow strip of glue along the edge of the material is quite adequate. Gluing to the back of the strut (the side *not* in prominent view) prevents any trace of the glue from being obvious once the finishing has been completed. (This shouldn't be a problem if you do the finishing work properly.) When one edge of the material has been attached to the strut and the glue has set, wrap the cloth tightly around the strut (overlapping the previously glued area), and glue it again to the back of the strut. This doubles the thickness of the material in that area, but finishing will conceal any trace of the overlap.

Once the glue has set properly, I use the heat-sealing iron to shrink the material tightly into place over the wood. If the glued area has been kept narrow and the material has been wrapped tightly, shrinking will provide a very tight, secure cover over the wood. The material I use shrinks so much that it makes a very solid bond between the wood and the wire.

Finishing is a piece of cake. I prefer to



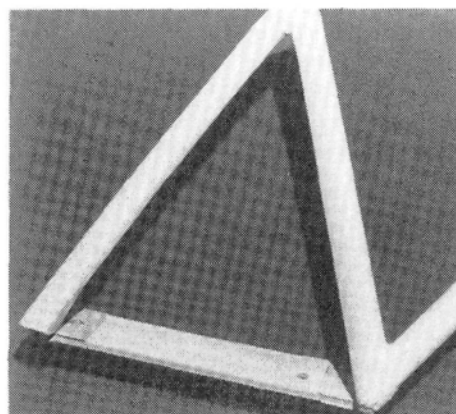
Dacron glued to rear of strut material. Note: All that's required is a narrow line of glue.



Strut material and wire strut are mated, and the Dacron is folded around both.



When the Dacron has been wrapped around the assembly, the end of the cloth is glued down over the previously glued area. (The glued areas should actually be slightly offset from one another.)



Der Jager cabane struts shaped and finished as described in column.

apply *finishing* resin over this material, as it's a lot easier to sand and is lighter than ordinary resin. However, any resin that you'd normally use on a model will do. When the resin has set properly, sanding it will produce a good surface. It might take several coats of resin to get the surface you want, because one coat usually won't do it. (The pieces in the pictures had three coats.)

You must be careful when sanding the initial coats, as it would be easy to cut right through the cloth. When the resin has built up a little, it's easy to add enough coats to provide a glass-like surface for painting. Light coats of resin, careful sanding, and using a really fine wet-and-dry paper will produce a finish that's as smooth as glass. Be sure you follow the directions for mixing the resin. The more resin, the faster the mixture cures, but don't push it by adding extra catalyst to get a faster cure. While adding more catalyst might cure the resin more quickly, it can also alter its characteristics. Heavily catalyzed resin can check and crack over time, and it's usually more brittle than resin that has been properly prepared.

In some cases, paint was applied to the full-scale airplane's wooden struts, but in others, the grain was left showing and

stained to provide a rich wood-grain finish. I've stained the wood before adding the material and then applied only clear resin over it; the cloth "disappears" once the resin has been applied, but check that the resin or finish you intend to use is compatible with the stain you apply to the wood. Do this on a sample strip of wood before you actually start work on the real thing.

The use of Dacron-based cloth and resin will provide a particularly secure attachment of wood to wire. Very little—short of a disastrous crash—will separate them and, if that happens, you'll have a lot more to worry about than struts!

In the case of landing-gear struts, it's a good idea to ensure that there's some room for the strut to move a little without bringing the fairing into contact with any other part of the model. (This is usually shown on the plans, but if it isn't, make sure you provide some "relief.") Any wire landing gear will "give" a little, even in normal landings, so providing some easement for the gear to move without damaging any other part of the model is a good idea. This method attaches the fairings very securely, and they'll be immovable when they've been properly applied.

This method will work just as well when you're applying fairings to wing struts, although it's a little more difficult to apply properly to the longer lengths of wood involved. To make the joint less obvious, the glued side goes to the bottom, of course. However, if adequate time and care are given to the job, there will be no visible signs of the glued area when the finishing has been completed.

Aluminum landing-gear blanks (which

require shaping) can also be finished using this method. The photograph shows the gear blank from my Balsa USA* Der Jager, which required that the usually flat blank be shaped by adding balsa facings. While such an odd shape requires more care than a straight-edge blank, some judicious slitting of the Dacron-based material allows it to take the shape of the blank and still wrap around the unusual



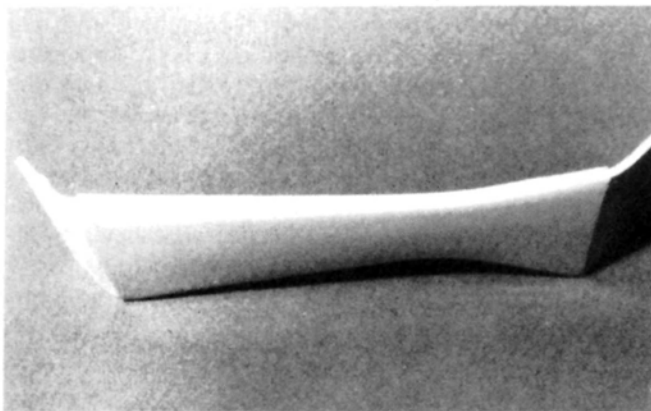
Lord mounts, readily available through industrial suppliers.

form of the Der Jager gear blank.

While not everyone agrees, I prefer to mount my engines with some provision for isolating the engine's vibration from the rest of the airplane. I've done this in a couple of ways, and I'll pass them along to you. Our radio gear doesn't take to vibration all that well, and I prefer to isolate the engine from the fuselage as much as I can.

Lord mounts are usually available at industrial supply houses, and they come in a variety of sizes. The ones I use have a standard thread on both ends, so finding nuts for them is no big deal. (I've found them complete with nuts and sometimes without, so having a source for the proper nut is a good idea.) The Lord mount is a piece of rubber with a threaded bolt projecting from each side. The bolts are actually separate, and there's no mechanical connection (other than the rubber) between the bolts. Each bolt end is long enough to pass through almost any material we'd be likely to use for fire walls,

(Continued on page 54)



Unusual-shape gear leg for Der Jager required addition of balsa fairing for accurate shape. Note smooth finish possible with surfacing resin.

GIANT STEPS

and almost any motor mount. It's also easy to place a washer between the Lord mount and the engine mount as a shim to provide any engine offset you need. They're a convenient and readily available method of isolating engine vibration.

The other method I use is one developed and used extensively by Wendell Hostetler*, who also does some very nice plans. Wendell uses a section of high-quality hose that he cuts just slightly longer than the thickness of the fire wall. As you can see from the section of one of his plans reproduced here, the slight extra length of hose is compressed a little by the pressure of the mounting bolts. This provides a secure mounting for the engine, and it also helps to isolate the engine's vibration from the fuselage. It would be a good idea to use a hose that will resist damage by oil and engine heat, although the latter shouldn't be a problem in a well-ventilated cowling. High-pressure hydraulic hose would be ideal, and the small quantity required (perhaps 3 to 4 inches for each model) wouldn't represent a significant expense.

Provocative Plans

I recently received some interesting material from Peter Kriz, long-time correspondent from Germany. The package was huge and contained a gang of Peter's plans, many of which are for some pretty

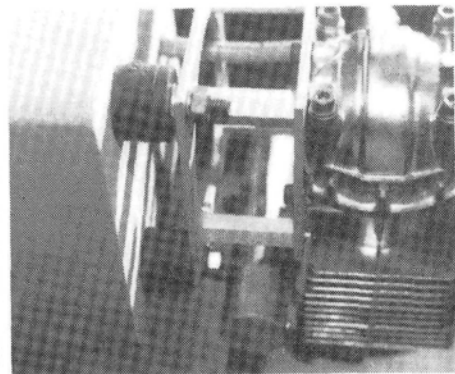
exotic airplanes. I won't try to give you a lot of detail on them, but my partner Col. de Vries and I will feature them in an upcoming volume of our Large Plans Directories. Just to whet your appetite, here's a list of them:

Fokker DR-1 (Scale 1:2.5)
Me 163 Komet (Scale 1/3; propeller driven)
Pitts S1S (Scale 1/2)
Robin R2160 (Span 9' 2")
Citabria (Scale 27 percent; span, 9' 3")
Praga Baby (Scale 1:3.5; span 10' 3")
Mace R-2 Shark (Scale 43 percent; span 6' 5 7/8")
Messerschmitt Bf109 F-1 (26%; span 8' 6")
FW 190 A-5 (26%; span 9' 11")
FW 56 Stosser (24%; span 8" 6")
Zlin 50L (Scale 1/3; span 9" 4 9/16")
Lake LA250 Renegade (Scale 22%; span 8" 5")
Gotha Go 150 (Scale 33 %; span 12' 11 1/8")
Polikarpov I-16 Type 24 (Scale 26%; span 7' 2 1/4")
Udet Flamingo (Scale 1/3; span 11" +)
Sukhoi Su26 (Scale 1/3; span 7' 10")
Supermarine S-6 (Scale 1/5; span 65")
Macchi MC-72 (Scale 1/5; span 74 7/16")
Hall Bulldog (Scale 1/3; span 97")

Some of these are rather obscure (at least, to me). I don't know much about the Gotha; but it's a twin-engined cabin model and looks a lot like the old Bamboo Bomber (Cessna Crane), although the engines are obviously in-line. The Polikarpov is also a stranger to me and is a stubby (obviously Russian) radial-engine fighter with retracts. The Sukhoi is a world-class competition aerobatic monoplane that slightly resembles the Zlin. The Lake amphibian looks like a great water model and could legitimately be flown off

land as well. Its pusher engine is mounted in a pod above the rear of the wing, and the stab and elevator are mounted high to remain clear of spray. Nice-looking airplane.

The good-looking Robin looks like a standard airplane, but I'm not at all famil-



Cross section of Hostetler-type vibration-isolation mount.

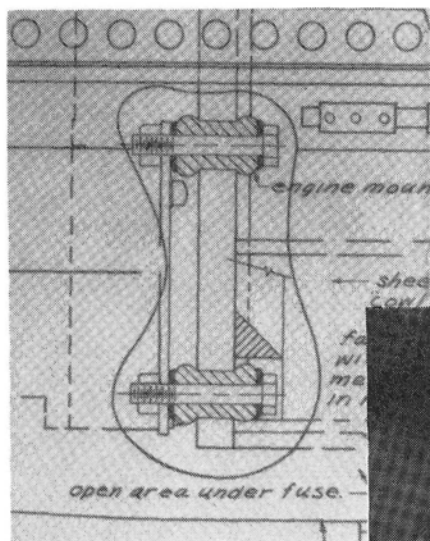
iar with it. Good-looking airplane! Neither the Praga Baby, nor the Mace R-2 is familiar to me. The sleek, speedy-looking Mace looks like a pylon polisher; the Praga Baby is a high-wing, tricycle-geared cabin airplane that looks like a standard civil airplane.

Without a doubt, this is a pretty wide-ranging assortment of models. Among the ones I mention, I guess there are a couple that would make striking scale models and would be unlikely to show up at every scale contest in the country. Now, when almost every airplane has been "modeled to death," it's nice to see some *really new* plans coming into the market.

Peter's plans are quite complete; some are in both German and English, but some are in only German; and most of the given measurements are metric. Neither of these features is a problem, however, as the plans themselves are clear enough to be used by the average experienced builder. The metric measurements are easily converted to our standard sizes, so there shouldn't really be any difficulties.

Some of the plans are unusual enough to warrant going to a little trouble to be able to build from them. If you want any further information on any of these plans, write to me at MAN, and I'll do my best to provide what you need. If you want to order the plans, I'll pass the word along to Peter. He also says he's working on some additional models, including the Macchi MC-72, the Supermarine S-6 and the Hall Bulldog. All of these have been well-done before, but he has some up his sleeve that you won't have seen *anywhere*. (More on these when they're available.) I hope to have the space to review the rare ones briefly over the next few months. Now, *that's* something you can look forward to!

*Here are the addresses of the companies mentioned in this article:
Aircraft Spruce & Specialty Co., P.O. Box 424, Fullerton, CA 92632.
Balsa USA, P.O. Box 164, Marinette, WI 54143.
Wendell Hostetler, 1041 Heatherwood Lane, Orrville, OH 44667.



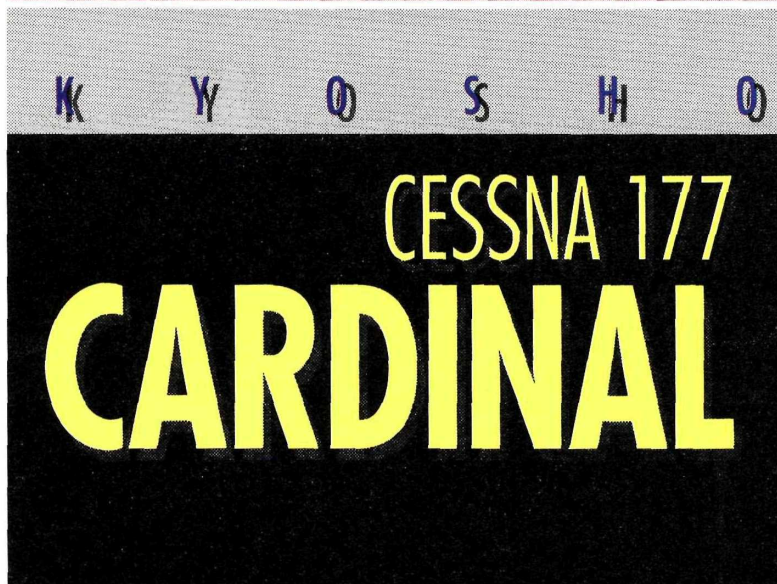
ABOVE: Vibration-isolating mounting detail from Wendell Hostetler plan. Method was developed by Hostetler.

RIGHT: Lord mounts in place. Note washer between upper Lord mount and backplate of engine mount. Washer provides easily controlled engine offset that can be altered as necessary.





Model making a "slow and low" pass for the camera. Note that camera has almost "frozen" the prop.



A pretty airplane deserves to be photographed with a pretty girl. Author's daughter Renee enjoys going to the flying field to watch dad fly.



Model hand-launches easily and should present no problems for one-man operation. Beginners should always have a helper to assist during launch.

Kyosho's electric version of Cessna's popular machine should find a receptive audience

by JOHN LUPPERGER

AS THE LEADER in electric ARF production and technology, Kyosho* now produces more than a dozen different electric ARFs in various sizes and styles. If you're interested in electric flight, chances are that Kyosho makes a model that will appeal to you.

Although other models in the Kyosho line are called trainers, the Cessna 177 best fits this description. At 17.5 ounces per square foot, the wing loading is slightly high for a primary trainer, but the thick, flat-bottom airfoil allows the model to fly quite slowly. The wing also has a fair amount of dihedral, which enhances the model's stability and makes it fairly easy

SPECIFICATIONS

Type: Electric ARF
Span: 46.9 inches
Weight: 42 to 44 ounces
Area: 365 square inches
Length: 34 inches
Wing Loading: 16.5 to 17.3 ounces per square foot
Motor Unit: LeMans Stock 05R with integral reduction unit
Propeller: 9x8, specially designed for electric power
Battery: 7.2V, 1200mAh

No. of Channels Req'd: 3 (rudder, elevator, speed control)
Suggested Retail Price: \$199.95

Review Model
Weight RTF: 44.5 ounces
Wing Loading: 17.5 ounces per square foot
Battery: 7.2V, 1200mAh
Radio: Futaba 4NBL Attack-E with 2 S-133 servos, and MCR-4A speed control/receiver

to fly.

THE KIT: Like all Kyosho kits, the Cessna 177 comes in a colorful, well-illustrated box. The pre-built components are wrapped in plastic and separated with cardboard. The hardware, small parts, motor, gear drive and landing gear are plastic-wrapped and/or boxed to protect the pre-built parts.

The fuselage is made of Kyosho's familiar LSS plastic. This lightweight material is quite strong, and since the fuselage is blow-molded, it has nice round contours. The wing is a conventional balsa, spruce and ply D-tube structure. Both the vertical and

glue, flight batteries and your radio.

The motor—a LeMans Stock can-type—has bushed bearings and a fiber-filled backplate. The gear drive is typical of all Kyosho models, with an open structure made of front and rear plates that support the main gear and output shaft. The pinion gear is brass and the main gear is fiber-filled plastic—a combination that's relatively quiet and results in very little gear wear.

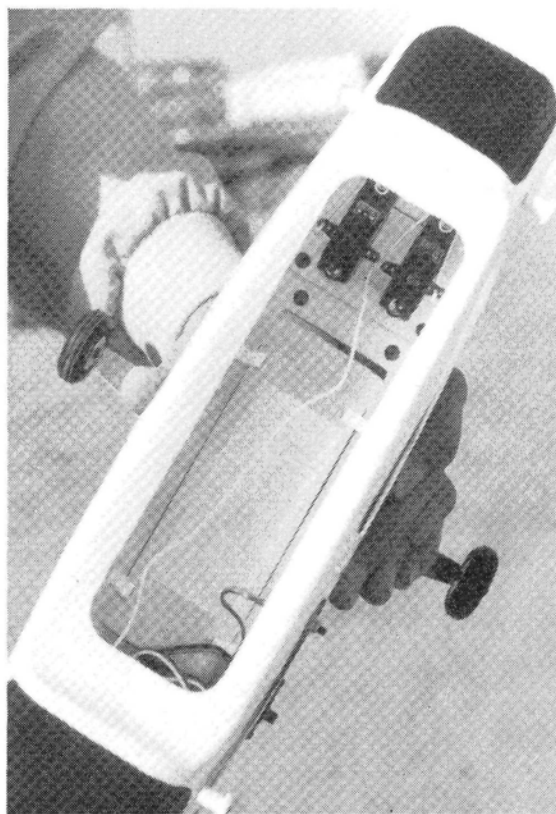


Overhead shot shows the nice lines of the tapered wing planform. Model handles nicely and has no tendency to tip-stall.

horizontal tail surfaces are built-up balsa and, like the wing, are covered with a plastic heat-shrink-type covering.

Every piece of hardware that's required for construction comes with the kit. You'll only need to provide

Since the Cessna 177 is an ARF and there's very little construction, no full-size plans are provided, but a 12-page instruction book is supplied, and it has well-illustrated clear line drawings. Although there are no written instructions, the exploded-view line



The flight batteries are held in place with two plastic clips. Radio compartment has plenty of room for all the gear.

drawings are a snap to follow.

CONSTRUCTION: Like other ARF models, making the Cessna 177 is actually an assembly process, rather than one of construction. I have "built" several ARFs, and I'm amazed at how much the new generation of models has progressed. Of all the ARFs I've put together, the Cessna 177 is one of the quickest and easiest to assemble.

First, mount the lightweight wheels to the landing gear. The main gear is a light Dural aluminum-type and the nose gear is a non-steerable sprung-wire unit. The main gear bolts to the fuselage and is backed up inside the fuselage with a plywood plate. A nylon gear mount is supplied for the nose gear, which is then screwed to the fuselage and into a plywood plate. Aluminum tubes with plastic end caps are used for the wing rubber-band hold-downs, which are held in place with screws. Everything is attached to the fuselage with screws or bolts, because the LSS plastic fuselage won't accept any adhesive. At first, this might seem to be a problem, but Kyosho has solved

(Continued on page 70)

THE FOKKER: Sorta looks like the WW I fighter flown by Rudolph Berthold, "The Mad Iron Knight"
Like our other Sort-A-Scale kits, it can be built & flown by a raw recruit. 56" wing, 4 lbs, .40 2-cycle or .46 4-cycle. Finished in Black Baron Metallflake films!



COVERITE

420 Babylon Rd., Horsham, PA 19044

MA

TOP GUN

(Continued from page 49)

Plans are already under way for next year's Top Gun, and we've been informed that the selection committee is hard at work making its final decision on who the new crop of gladiators will be. Something

new will be added to the program, though: There will be a "Team Scale" category, which will allow super builders to team up with super fliers and compete. Can you imagine? Some of those perfectly built, static-show hangar queens being flown by the likes of Dan Parsons and Ted White! I sure hope I'm invited back next year—I

only have a little bit more to do on the T-6! Now, let's see ... hmmm ... if I can team up with Don Muddiman ...! ■

Watch for the 13th Edition of the RADIO CONTROL BUYERS GUIDE

Coming in September from Kalmbach!

• **Aircraft • Cars • Boats • Radios**
• **Systems • Engines • Hardware**
• **Books • Videos • Finishing materials •**
Accessories • R/C dealers • Plus much more!

Kalmbach Publishing Co., 1027 N. 7th St., Milwaukee, WI 53233

FIELD & BENCH REVIEW

SPECIFICATIONS

Type: Sport/stand-off scale
Span: 61 inches
Weight: 5 pounds, 9 ounces
Wing Area: 760 square inches
Power Req'd.: .40 - .60 2-stroke; .60 - .90 4-stroke
No. of Channels Req'd.: 4
Suggested Retail: \$106.95



by REED KALISHER

DYNAFITE FUN - SCALE MUSTANG 60

A redesigned, re-engineered, revitalized favorite that's well suited to the budding warbird!

SO THERE I am, sitting in "RU's" office, when I spot this P-51 kit from Dynafite*. I've always wanted to build a warbird, but never seemed to move away from sportsters and ARFs. Now I'm on my knees, pleading with Rich to let me do this kit. (It always worked for me as a kid!) "I won't let you down!" I shout, as I

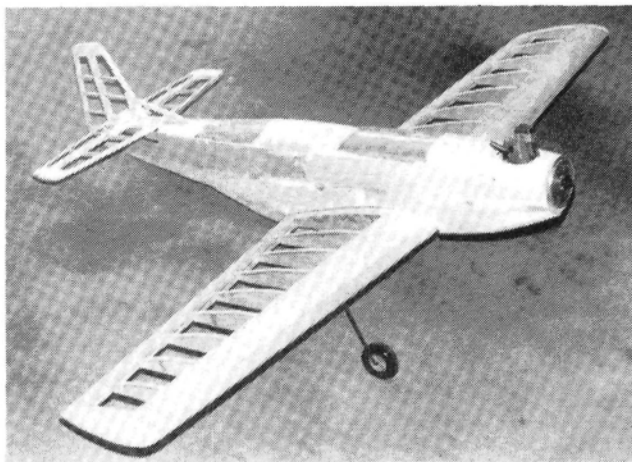
hightail it out of the office with the box under my arm. I figure he gave in just to shut me up and get me out, so I want to leave the premises before he changes his mind.

When I finally get home, I rip open the box and begin to study this lifelong "ambition of mine." There were quite a few pleasant surprises in store for me. There were also a few minor bugaboos, but they're so few that I'll address them as I come to them. So, let's get started!

THE KIT: The very first thing I noticed was the quality of the wood and the cuts: The pieces just fell out of the masters with a slight tap. Only a few of the ply sheets required a little coaxing. No warps, no breaks, no complaints!

Next, the plans. They're printed on one large sheet along with the instructions. I cut them into two sheets, since the wings are built on the plan, but the rest of the ship is not. The instructions were a little on the light side, but Lou Nelli from Dynaflyte assured me that they'll soon be changing to a separate booklet. No matter! Just take your time, study carefully, and you'll have no problems.

The kit includes most of the hardware you'll need, but I opted to replace a few parts here and there, mostly on personal whim. The tail-wheel assembly (a thin piece of wire to be inserted into



Framed up, awaiting canopy and covering, the Dynaflyte 51 doesn't look that different from the Loehle 5151 shown elsewhere in this issue.

the rudder) should be replaced by any reasonable tail-wheel assembly that you like.

This is a good time to decide on any modifications you might like to make. I opted to replace the rubber-band wing attachment with a bolt-on, since I was going for scale-like appearance. Make your notes now, and then move on to building the bird.

CONSTRUCTION: For no good reason, I built the wing

Dynaflyte Mustang 60

READER'S REPORT

by Jon Snyder

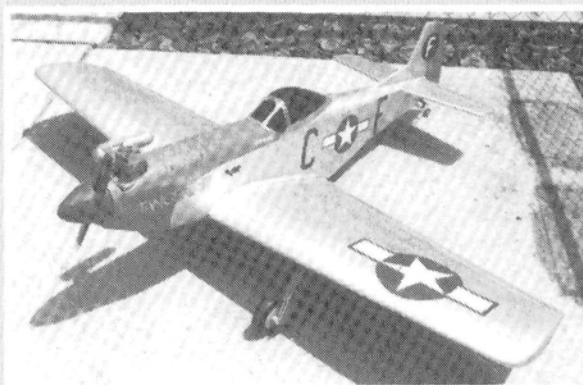
HAVING RECENTLY completed a Mark's Models (now Dynaflyte) Fun-Scale Mustang 60, I thought you might be interested in a "Reader Report" on this fine airplane.

This is my third year in R/C and the third model that I've built, although I have seven airplanes. I wanted to try my S.T. S90 engine in this model. I previously had a .60-size Corsair, and it made me aware of the tricky characteristics this type of airplane sometime exhibit. I wanted a Warbird that looked great and yet could be brought back to earth without a 200mph final approach. This Mustang is it.

The wood quality and die-cutting are good, although I had to replace all the warped 3/8-inch square stock. The plans are terrible, especially since there's no full-size top and side view of the fuselage. This should be corrected. In my opinion, the frame is built too light. I added considerable material to the inside to strengthen where necessary, especially in the nose and wing. [Editor's note: Bear

in mind that this model wasn't designed for as potent an engine as a 2-stroke .90.] I added wing bolts and dowels instead of rubber bands. Actually, I made some 40 modifications to the plans, but the outside shape remained the same.

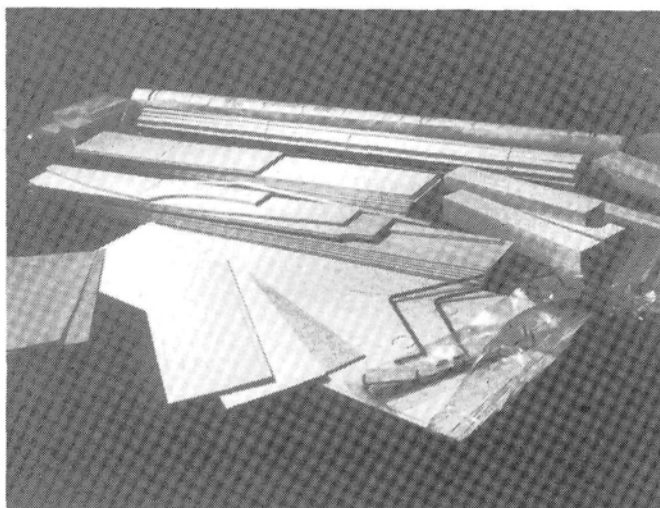
At 8 pounds, 4 ounces and a wing loading of 25 ounces per square foot, the performance is outstanding. With the .90-size engine, Master Airscrew 13-6 nylon prop and stock muffler with exit hole opened to 5/16 diameter, it's quite fast. Recently, another R/C magazine reviewed this kit and said that this Mustang just couldn't be a fast airplane. Perhaps they didn't build or set it up properly. Mine is fast and lands like a trainer. Vertical climb is really good, and it's quite aerobatic. Landings on a calm day are brisk, and a



little head wind helps to slow it down.

I covered my Mustang with Ultracote silver with blue trim and USAF markings. It looks great and receives a lot of attention at our field.

All in all, this is a good kit that can take a wide variety of engines. I highly recommend it to those looking for something a little different. It would be nice to see more airplanes like this at our field, instead of all those boxes with wings. ■



Quite an assortment of lumber and wire, which will eventually form a neat airplane.



Each fuselage side consists of five die-cut pieces. Parts fit well.

first. Most wings are built one at a time and then joined together with hardwood and epoxy. To keep the weight down, Dynaflyte has designed the wing around a one-piece spar that's built up from a large wide triangle and the spar material. This means the dihedral is preset and the wings are built onto the same assembly.

Please constantly check for warps or misalignments, as the slightest twist will show up in the plane's flight characteristics. If you are going to go the way of the bolts, be sure to beef up the center section behind the leading edge to accept and support the dowel. You might also want to add some balsa blocks inside the fake intake cowl to support the bolt heads.

When cutting out the slot for the aileron control rods, be sure not to

take out too much wood, or the resulting play will induce a lot of slop and flutter.

The fuselage builds like a jigsaw puzzle. Be careful to make the left and right sides exactly the same. When inserting the main bulkheads and formers, make sure that they're square. Again, if you use the wing-bolt system, replace the former at the leading edge with one cut from a heavier plywood. (The lite-ply supplied might not offer the support you require.)

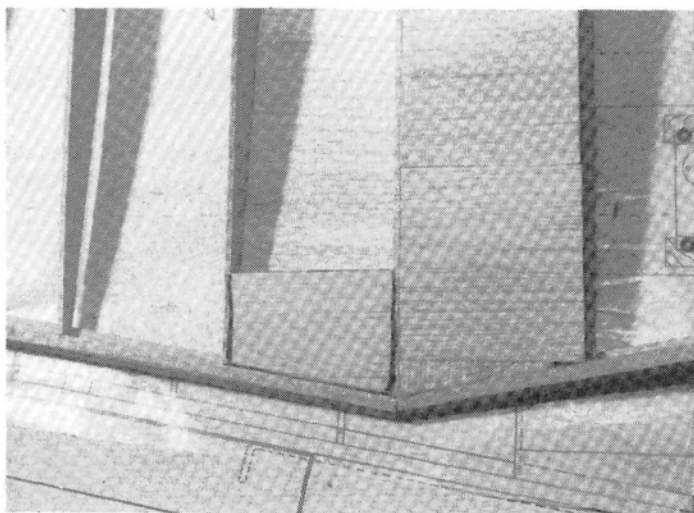
When the main formers are in place, don't add the rear ones at an angle and close, as instructed. Instead, pinch the tail together and tack it shut. Next, locate, insert and tack the rear formers into place. I followed the instruction method and had a fuselage that would fly in eternal

circles. Check to be sure the work is straight, then finish the gluing.

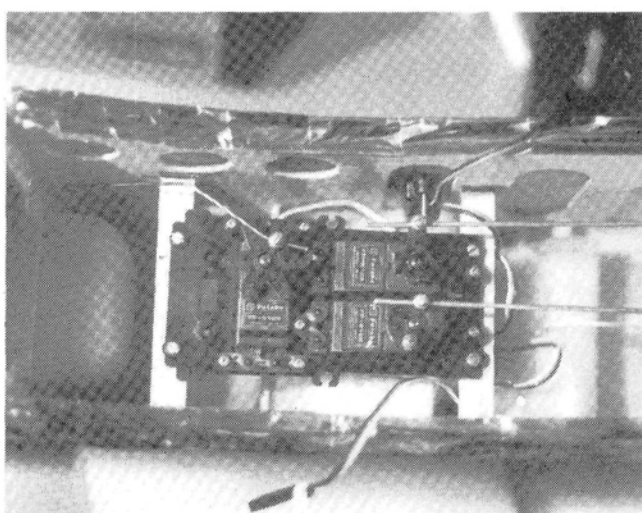
The motor mount has a built-in downthrust, so install it exactly as described and then fuelproof the finished nose area with epoxy or a few coats of butyrate dope.

According to the plan, the main landing-gear struts extend vertically from the wing with no forward rake, but the long nose and downthrust demand that you bend them forward about 1 inch ahead of the leading edge to place the center of the wheel. If you don't, rest assured that your bird will be very clumsy on the ground. As I said before, install a tail-wheel assembly of your choice, *not* the one described in the kit, because the wire is too thin and all the weight is on the rudder.

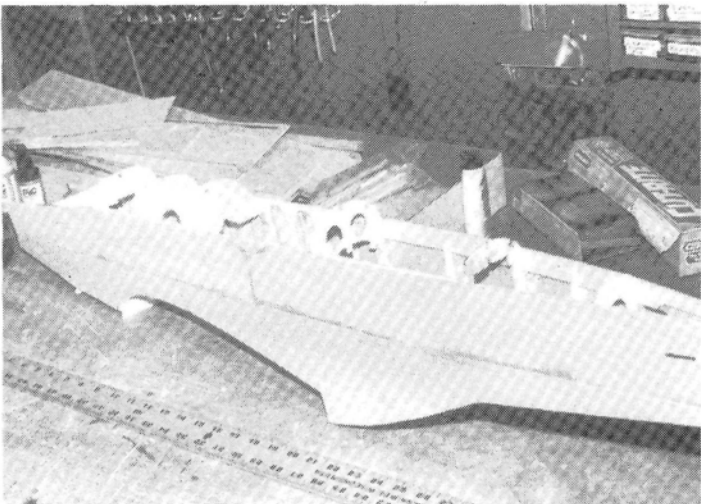
The plans offer a wide selection of



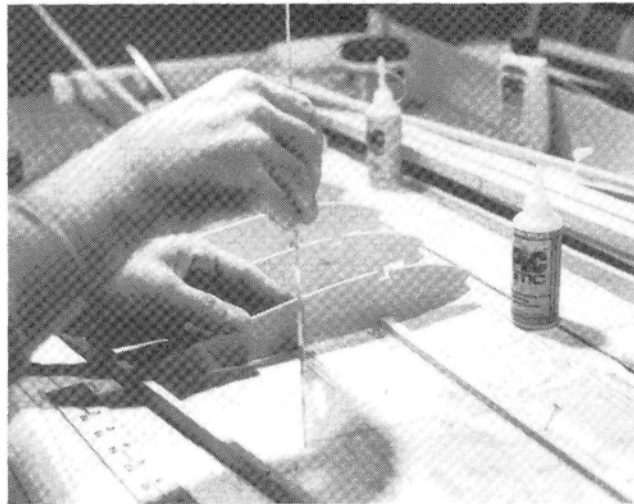
Balsa blocks were installed in wing to allow use of nylon bolts for wing attachment, rather than rubber bands and dowels.



As can be seen, there's plenty of room for radio installation. Position components to properly locate CG.



Fuselage build-up nearing completion. Easy-to-assemble structure keys together.



A 90-degree square or triangle is used to ensure wing ribs are installed perpendicular to spar.

engines, but the plane was really designed around a 4-cycle, 60-size powerplant. I opted for the O.S.* FS-61 4-stroke. I was told that most big 2-cycles will vibrate the wing covering and produce a whining hum. With a little squeezing, a 12-ounce tank was inserted for a nice long ride.

Since I wanted a scale appearance, I used Top Flite* MonoKote in chrome with trim sheets. The decals are available from various sources to meet different design goals. The fillets around the wings gave me a few fits but—finally!—it was covered.

If you use a metallic covering like this one, I strongly urge you to use an FM radio, which seems to reduce the possibility of interference caused by the metal. I selected my Futaba* FG Series, FM. Check the CG to determine the correct location of the

receiver and servo tray. My Mustang balanced right where the plans indicated—just along the spar—so I put the radio goodies right up under the cockpit. Lots of room inside to work, so do it *right*. (There's no excuse not to!)

Now, the plans say this plane should weigh 5 pounds. Mine weighed about 1/2 pound more, owing to the extras I'd added, but it didn't affect the plane's performance. I ran the antenna through a fake radio box, behind the pilot and out through the top of the canopy. It looked great, but would it fly? (A question I always ask, because of my dubious building skills!)

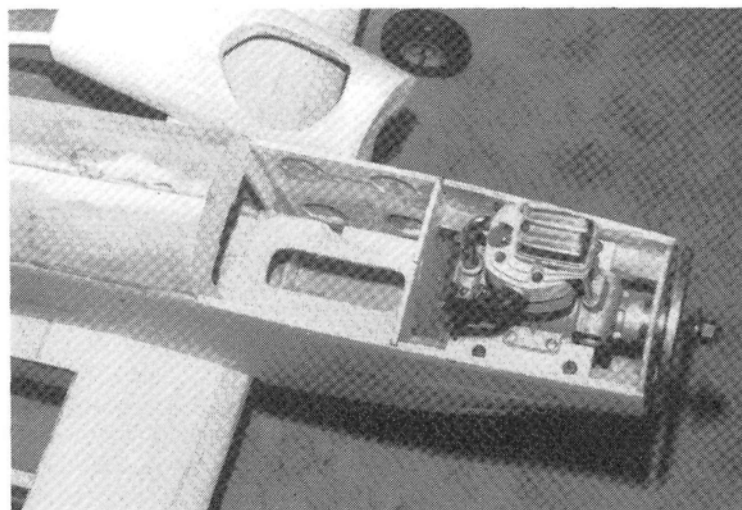
FLYING THE BIRD: Weather skunked my first two attempts to fly this pretty lady, but the third weekend was a charm. Hope you realize

the difficulties involved in simultaneously flying and photographing an airplane. I enlisted the help of my friend Dave Baron, who is one of those pilots who can fly the box your kit came in and outperform it, too!

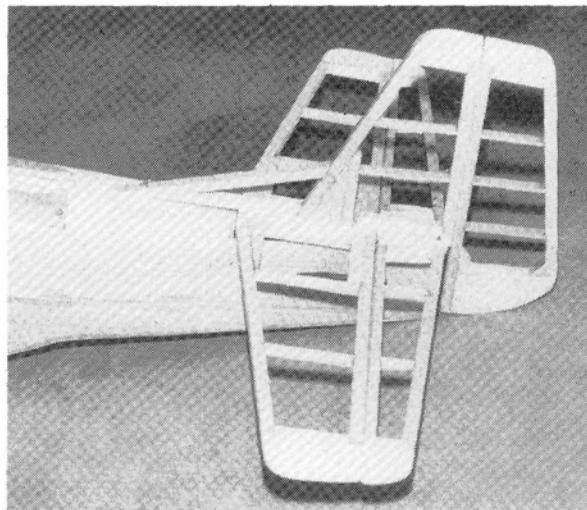
So I'm confident about the stickman; the bird is fully checked out; the sun is shining; and the throttle is nailed. A few realistic bounces and it's up; a few minor trim changes and the first low pass for the camera. (It was at this point that Dave reminded me to start breathing again!) Verrrry pretty!

After the photo session, it's my turn to take the box. The wind is gusting a bit from the north, but the Mustang doesn't notice it. It flies on rails, does snug loops, smooth rolls, hustles with the throttle open and

(Continued on page 113)



Front end of Mustang with 4-stroke O.S. installed on mounting plate. Tank compartment is adequately sized and positions tank properly.



Tail group on Mustang is a simple, built-up balsa structure. Lightweight, but adequate for the job.



Small Steps

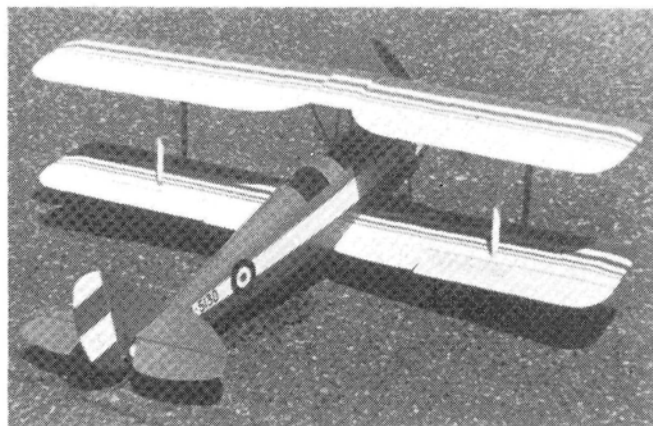
by JOE WAGNER

THE POPULARITY OF small R/C models keeps growing! More and more modelers are discovering their advantages and finding out that most of their supposed drawbacks are myths. I received a nice letter recently from Jim Waterman, the R/C Trainer Report man from San Antonio, TX. In early editions of his widely read evaluation of trainer-type airplanes, Jim strongly advised against learning to fly R/C with any model powered by an engine with a displacement of less than .40. But in his latest revision, Jim lists a couple of small R/C aircraft as being exceptionally good performers—far better than some of the most widely advertised large-motor “trainers”!

Of course, just because an R/C airplane has a small engine, it doesn't have to be tiny itself. Truly miniature R/Cs can be fun, and they're a highly challenging form of modeling, but the majority of “Small Steps” readers' projects are fairly good-sized aircraft, or even rather large ones. Look at the Dynafite (formerly Craft-Air) Piece O' Cake and Butterfly. The Piece O' Cake is a 6-footer with 570 square inches of wing. It's powered by an .049. The 99-inch-span (910 square-inch) Butterfly is designed for .10 to .20 engines. Both models are so docile in flight that an absolute novice can handle one easily, and Jim highly recommends both as ideal R/C trainers.

The increasing popularity of small-engine R/C models shows up clearly at the Mid-Arkansas Radio Control Society (MARCS), which has headquarters in Little Rock. Its 170 members build and fly scads of small R/C models, many of which are original designs notable for their ingenuity, craftsmanship and sheer “flyability.”

Last February, I attended a MARCS meeting at which five new R/C airplanes were displayed in a show-and-tell session. Four of the five were .049-powered! (The other was a magnificent giant-scale Kinner “Sportster.”) Earlier that evening, at Steve Staples' workshop, I saw several more off-the-beaten-track 1/2A R/C models, including Steve's own design twin-rotor autogiro and Paul Willenborg's close-to-scale RFB Fantrainer. (I'd include photos of these here, but I have so many great pics of more conventional airplanes that I'm saving the unusual types for a col-



A nicely done Tiger Moth by Gordon Fraleigh (Little Rock, AR). It's Super Tigre-powered and was built from the .20-size Pilot kit.

Notable among MARCS members is Henry “H.A.” Thomas, who is possibly the most talented man in modeling. Now in his 70s, H.A. contributed regularly for many years to model publications (among them *Air Trails*, *American Modeler* and, of course, *Model Airplane News*) on free flight, U-control, R/C and even solid-scale models. He is still as active as ever—nowadays, mainly with small-engine R/C airplanes. He has always been an innovator, and his latest projects are no exception. His “Henry T” 1/2A design is unusual in that it has wing flaps as an auxiliary control. They can be set to provide maximum lift for soaring flight in calm weather, in full “up” position for fast flying in the wind, or anywhere in between. They work so well that I must include them in one



Steve Staples launches his “Luton Minor” at the MARCS flying field near Little Rock. Made from a Flyline kit, the model spans 34 inches.

umn devoted entirely to offbeat R/C aircraft. This is an area of modeling in which mini-size projects are especially practical.)

of my own upcoming projects!

A big advantage of H.A.'s wing flaps is that in any “down” setting, they eliminate tip-stall completely. When the

model's wing approaches its critical angle of attack, as in a climb-out that's too steep, the "flapped area" inboard stalls first. This loss of lift directs the airplane's nose downward. The

outboard wing panels, being "unstalled," provide lateral support to prevent any snap-rolling tendency while the airplane automatically picks up speed and resumes its normal flight.

This sort of feature can be exceedingly valuable in relatively low-powered R/C models such as ours, which climb on their wing lift rather than excessive engine thrust. In flying this kind of airplane, it's all too easy to pull a bit more up-elevator than you should. If you do, H.A. Thomas' wing flaps will save the day!

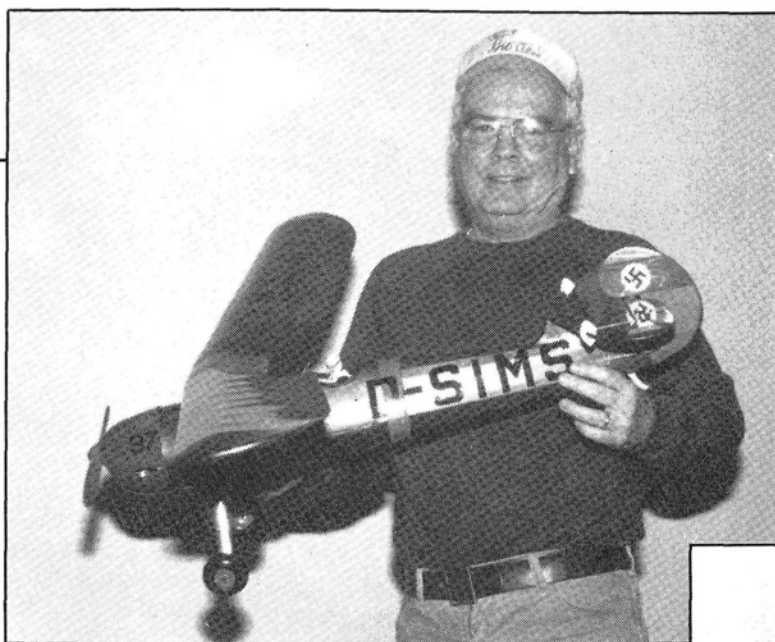
All the airplanes at the MARCS show-and-tell session were scratch-built, and

get started. One way is to adapt an existing design, such as a good rubber-powered scale model. Plans can be enlarged with photocopiers. It might require several overlapping exposures and many photocopy sheets carefully pieced together with tape, but it's a great deal quicker than scaling-up plans the traditional way with mechanical drafting techniques.

A new source of high-quality scale model plans suitable for photocopier enlarging into R/C-size projects is Flying Scale Incorporated* (FSI). Their drawings

Left: Emmett Fry with the magnificent Focke-Wulf "Stosser" he designed and built. Spanning 44 inches and powered by an Enya .15, it's a 3-channel R/C model: rudder, elevators and throttle.

Below: H.A. Thomas' beautiful 52-inch "Spitfire I" in flight. It's scratch-built and powered by an O.S. .25. It flies as well as it looks!



H.A. Thomas' 8-year-old "Henry T." (The movable surfaces on the wing are flaps, not ailerons.) It's Black Widow-powered, and was featured in Model Aviation some months ago.

three were designed by their builders. Many other R/C modelers would like to do the same—particularly with scale types—but they aren't quite sure how to

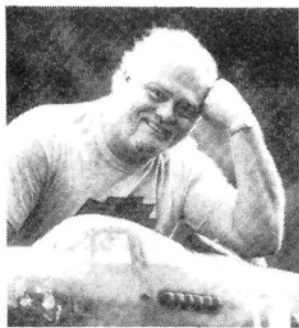
are among the best I've ever seen—far better engineered than even the legendary Cleveland Model Company scale models of the good old days.

So far, FSI has completed plans for about 50 airplanes, including many of my favorites: Albatross D-III; Fleet Trainer; Ryan ST; Nieuport 17; Curtiss Helldiver; Stinson Reliant; Sopwith 1 $\frac{1}{2}$ Strutter; Waco K; and Boeing F4B-1. Except for a few plans for very small airplanes such as the Corben Super Ace and Art Chester's Jeep racer (which are drawn 1 inch to 1 foot), all are drawn to $\frac{3}{4}$ -inch-to-1-foot scale.

Most copiers capable of enlarging can produce up to 141 percent expansion. FSI plans scaled-up this much are just the right size for .049 to .10 power. Take their Curtiss F6C-3 U.S. Navy biplane fighter (essentially identical to the U.S. Army Air Corps P-1 Pursuit): In $\frac{3}{4}$ -inch scale, it has 142 square inches of wing area—perhaps suitable for Cox .020 or G-Mark .03 power, as is. Enlarged 141 percent, the wing area goes up to 284 square inches for a span of 33 $\frac{1}{2}$ inches and an overall length of just over 24 inches. Other types are comparable.

As for constructing an R/C version of one of these airplanes, the built-up arrangement shown on the FSI plan could be used, with some judicious sheet-balsa reinforcements here and there. A stronger

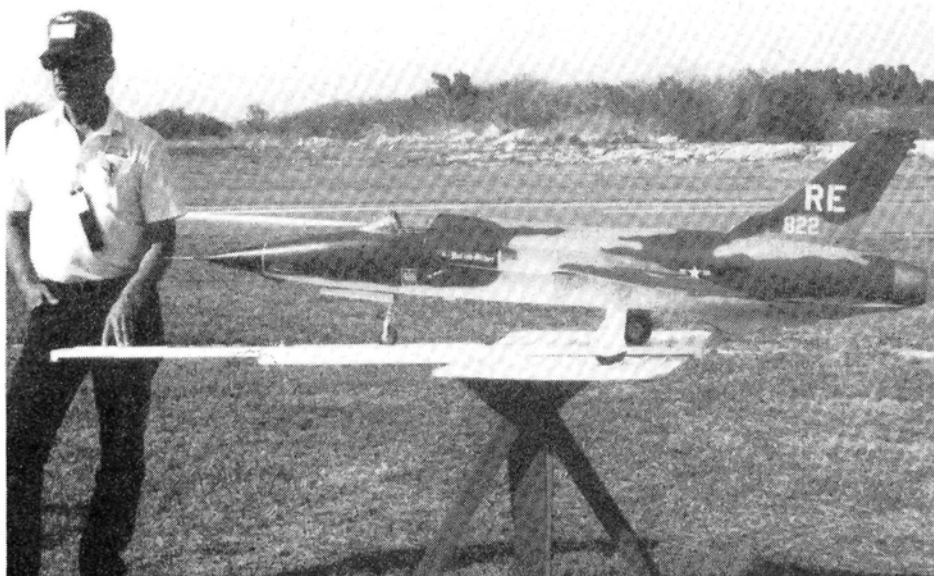
(Continued on page 109)



Sporty Scale

by FRANK TIANO

T.G., Spinners and Big Gas!



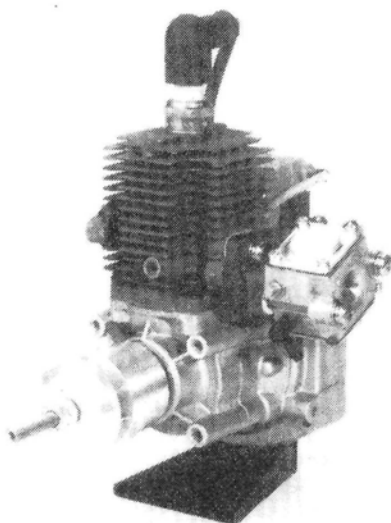
Mike Kulczyk, receiving a transfusion from his F-105D Thunderchief during static-judging portion of Top Gun tournament. His score was 85.57—tough competition!

THIS MONTH, YOU'RE gonna get a potpourri. Just like Webster's definition: a combination of incongruous elements. No particular theme; just some stuff I thought you might like to hear.

By the time you read this, the Top Gun Invitational will be history. Col. Stunning will provide the blow-by-blow in a separate article, but I'll be passing along a lot of stuff throughout the next 10 months. As you might have heard (or *will* hear), there were *seven* major crashes at Top Gun, and I just want to get the records straight right now: There were no radio interference problems. We had a couple of very sick engine runs owing to weather changes, an in-flight structural failure, one case of switching feet in the sun, one battery-pack failure, one poor-gas-mileage problem and one case of an engine that tried to rearrange its parts during flight!

That was a real shame! Mike Kulczyk's F-105 was doing just fine until a recurring problem caused the jet to flame-out and take an escalator-type route back to the runway. The cause of the problem is simple: The head bolts in Mike's O.S. .77 ducted-fan engine loosened after a few minutes' running, and no matter what he

did, it happened repeatedly. It seems that the threads on these bolts are slightly undersize, and this allowed them to change dimension when heated and vi-



Zenoah G-23 is a perfect gas powerplant for many of the larger-scale models that are becoming so popular. Displacement: 1.38 cubic inch.

brated. This caused them to back out of their respective receptacles, which loosened the head, which caused a loss of compression, which caused the engine to gasp and quit running, which caused the Viojett's rotor to cease functioning, which caused the A.G.D. to quit, which resulted in a quick trip to the bottom—if you get my drift! Latest word is that Mike will rebuild the Thud, especially since Futaba gave him a nifty 1024 “do-everything” radio for the “Critics Choice Award” at Top Gun. We understand that, if he doesn't find a solution in a hurry, Mike just might switch over to one of the new KBV .82s.

Safe Spinners

Large spinners can be dangerous if not fastened to your engine properly. Anything over 4 inches, spinning at speeds in excess of 8,000rpm, just can't be held safely with the old standard 8-32 bolt. The bolt starts to flex and might break; or it starts to flex and the spinner explodes; or it starts whipping and causes the spinner, prop, nuts, backplate—et al—to come flying off into somebody's face! Now, unless you have a mail-order degree in plastic surgery, I strongly suggest that you contact Lee Robinson at Robinaire* for one of his spinner/prop nuts that are custom-designed for almost any engine. These nuts hold the propeller and key firmly in the backplate, and they can't whip around as you play with that throttle lever, simply because they measure a full 1/2 inch in diameter all the way out to the tip of the spinner! Mike Bacon's sketch should make things a little clearer for you.

Likely Landings

Since telling you all about Dave Platt's “Competition Plus” retracting landing gear, I've heard from two other manufacturers who claim to produce gear of the same size. Well, one of these companies is a basement operation that features hand-forged units completed in a Sears Roebuck vise with the aid of a Stanley ball-peen hammer and a chisel! The other set was demonstrated by Impact Engi-

Techniques

neering*, and this seems to be very well constructed. So if you thought you didn't have a choice, maybe you should send for Impact's catalog and take a look for yourself. I'll report more after I get my own set of gear.

Calculator Caper

Bill Steffes from Schenectady, NY, is almost ready for the test flight of his Ziroli-designed B-25 Mitchell. This 100-inch beauty is powered by a pair of Zenoah G-23s and weighs a tad over 32 pounds. Turning a pair of Zinger 15x8s at 8,500 should prove to be more than enough poke. Once again, I'll keep you posted.

Speaking about poke, do you know how to figure the approximate speed of your aircraft, given the correct rpm and diameter? No? Well, first you take a peek at the propeller you're using. Somewhere along the blade or around the hub will be a short series of numbers. The first num-

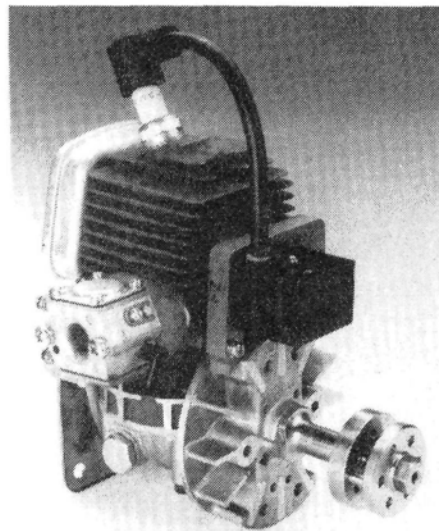
ber is the outer extremities of that twirling propeller will give you a reading in rpm. Next, take a calculator, and punch into it the following formula: pitch x rpm divided by 1056, multiplied by 95 percent. The answer will be very close to the flight speed of your aircraft at full throttle. I've tested the formula numerous times at the Rhinebeck Time Trials and hit it very close.

Of course, a couple of things could change the result: One of them is the wind—its speed and direction; the other is the type of poke you're dealing with. For instance, take a screamin' Rossi .40 set up on 40-percent nitro with an 8 1/2 x 8 1/2 toothpick prop turning 20,000 rpm, bolt that sucker to a 24-pound Bert Baker Thunderbolt, and I can guarantee that you ain't goin' no place! But bolt that little snot on a Scat Cat, plug in the formula, and you're looking at 153mph! In the case of the Jug, take a Zenoah G-38 turning an 18x10 at 7800, plug in the formula, and you're looking at 70mph, which is probably exactly where you want to be with a 1/5- to 1/6-scale P-47.

Engine Talk

Speaking of Zenoah engines, while looking for an alternative to my O.S. 108 and Super Tigre 2500 glow engines, I stumbled across the Zenoah line that's distributed by World Engines* and available at your favorite hobby shop. These reliable gas engines cover a full range of displacements. The G-23 I'm using in my new twin offers 1.38 cubes and turns a 15x8 at 8,500. That's good enough for me!

For a couple of reasons, I'm now looking seriously at the gas jobs: First, the weather conditions here in Florida can sometimes be lousy and very humid, necessitating constant needle-valve changes, and second, I'm getting a little tired of unreliable engine runs—or lack of running—owing to those conditions. While mowing my lawn the other day, I realized that my lawnmower reacts the same whether I push it through tall grass or the short stuff, whether it's December or July, night or day, Tuesday or Saturday, humid



Slightly larger Zenoah (the G-38) is the middle size in the line and displaces 2.28 cubic inches; weighs 4.4 pounds and can be used in models in the 20- to 24-pound range.

or dry. It also occurred to me that this little powerhouse didn't care if I used Good Gulf, Mighty Mobil, or American American. And best of all, when I run the mower into a thick bunch of wet grass, the mower just bogs down and slows up a little bit—but never *quits*!! That's why I'm looking into engines like the Zenoah. They're compact, honestly priced, powerful and friendly. (More later.)

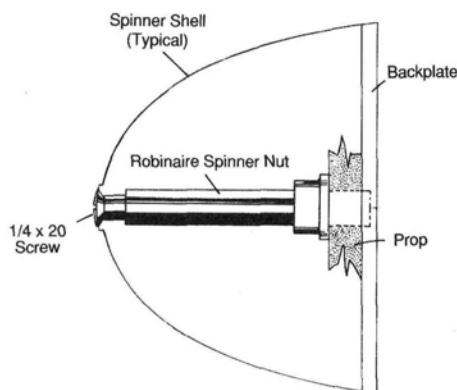
Next month, I'll talk about more specific stuff. In the meantime, remember the three most important things about scale modeling:

- Never ask Stunning to drive your girlfriend or wife home
- Lionel smoke tablets will *not* work in an O.S. radial
- Always—especially when Stunning is in the vicinity—*always* check your six!

**Here are the addresses of the companies mentioned in this article:*

Robinaire, P.O. Box 6766, Lake Worth, FL 33466.
Impact Engineering, 2100 Stonehill Ct., Arlington, TX 76012.

World Engines, 8960 Rossash Ave., Cincinnati, OH 45236.



Large-spinner safety is improved by using the Robinaire spinner nut. Large diameter is the secret.

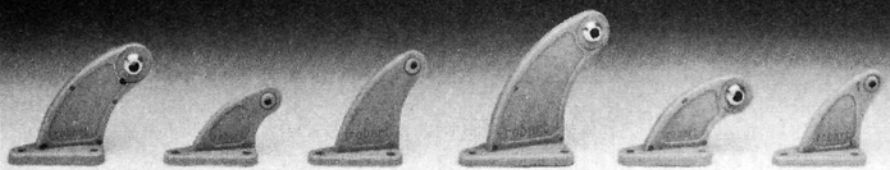
ber is usually the diameter, the small "x" simply means "times" and the last numbers mean the pitch of the blades. Therefore, an "18x6" prop means that the device is 18 inches long and has a pitch of 6 inches. Go to your hobby shop and purchase a neat gizmo called a tachometer. This device, when held somewhere near

We're Tooting Our Own Horns!

That's because Robart Ball Link Control Horns have a lot to toot about! Their rotating ball link makes any application possible without bending or kinking pushrods! They have a sturdy, three-hole mount and a realistic, scale appearance. They're available in a variety of sizes, all designed to give you a much tighter, cleaner and more exact control system. And when you add it up, Robart Ball Link Control Horns are even less expensive than the others! We're not bragging... just showing off!

robart

AT YOUR FAVORITE HOBBY SUPPLIER



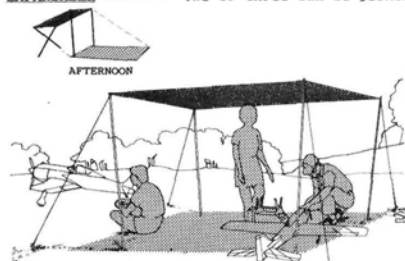
© Robart Mfg. 1988

P.O. Box 1247 St. Charles, Illinois 60174

HOT? BE COOL! STAY COOL.

PORTA-SHADE

CONVENIENT SIZES ----- 6'x10, 9'x10 & 9'x18'
PLUS FEATURES NOT FOUND IN OTHER SUN SHADES.
COOL-PROTECTION ----- Opaque canopy, white or silver top side, provides heat reflection and protection from sun rays & keeps you cooler.
QUICK ERECTING -- 5 min. by one person on 6'x10
WIND-RESISTANT ----- 6'x10' tested to 40 MPH.
ROOMY ----- No center pole and nearly 7' tall.
ADJUSTABLE ----- Level or tilted for more shade.
STRONG ----- Unique riveted corners, no grommets.
EXPANDABLE ----- Two or three can be joined.



AT CONTEST OR FLYING FIELD



| | |
|-----------------------|----------------------|
| Economy 6'x10' | \$32.95 + \$3.00 UPS |
| Sportsman 6'x10' | \$39.95 + \$3.00 UPS |
| Dining 9'x10' | \$52.00 + \$3.00 UPS |
| Add-A-Shade 6'x10' | \$29.95 + \$3.00 UPS |
| Add-A-Shade 9'x10' | \$42.00 + \$3.00 UPS |
| Sportking 9'x18' | \$85.00 + \$4.50 UPS |
| Mech. Tote-Tarp 4'x6' | \$ 9.95 + \$1.50 UPS |
| Trak-Lok-Eye Kit TAA2 | \$10.00 + \$1.50 UPS |
| Trak-Lok-Eye Kit TAA3 | \$14.50 + \$1.50 UPS |

With TLE Kit any Porta-Shade can be used as an awning on any R/V equipped with a canopy track.

Visa-MasterCard-COD Checks --- Dealer Inquiries Invited. FREE literature on all 4M Co. products.

THE FOUR "M" COMPANY

209 S.W. BUCY AVE.
 BARTLESVILLE, OK 74603
 Ph. 918-336-9445

CLEVELAND'S GIANTS!

MANY NEW! FOR R/C-BUFFS

Designed As Basic, Master Flying Models Following

Built-Up Prototype Practice of Wood and Fabric.

If Replica Builders Use Them--Shouldn't You?

Many New! Historically Presented!

- 87" Curt JN4 Jenny \$37. 81" DH Mosquito B'b \$42.
- 84 Fokker D-7 Fr. \$39. 108 DH Mosquito Bomb \$55.
- 70 Bayles Gee-Bee \$32. 98 Stear PT17Koydet \$56.
- 60 Howard Pete Race \$32. 99 N. Blk Widow P61 \$69.
- 60 Supermarine S.6B \$24. 71 Doug. DC-3 (C47) \$35.
- 89 Supermarine S.6B \$35. 95 Doug. DC-3 (C47) \$35.
- 63 Curt. Hawk P-6E \$42. 86 Hawks Texaco 13 \$32.
- 94 Curt. Hawk P-6E \$54. 64 Stout Sky-Car \$18.
- 74 Doolittle G-B 11 \$48. 72 Cor. 02U1/4 L&S \$46.
- 95 Monocoupe Sport \$36. 108 Cor. 02U1/4 L&S \$56.
- 80 Hall Spr Bulldog \$43. 60 Douglas M-2 Mail \$24.
- 107 Aerona C-3 Spt \$35. 68 Bristol Bulldog Fr. \$30.
- 62 Howard Race Ike \$45. 59 Brwn Race Mst. A. \$54.
- 78 Turner's W-W Rac \$35. 107 Grum Bearcat F8F \$54.
- 63 Cur Gosh'k F11C \$42. 69 Lindbergs NX-211 \$28.
- 94 Cur Gosh'k F11C \$54. 91 Lindbergs NX-211 \$39.
- 66 DeHav Comet Rac \$24. 96 Wr. NW-1 Nav Rac \$48.
- 62 How. Mr. Mulligan \$35. 74 C. Helldivr SB2C-4 \$55.
- 94 How. Mr. Mulligan \$45. 108 Fairch. PT-19 Tr. \$59.
- 63 Boeing P-26A Fr. \$36. 60 Waco Taper-Wing \$36.
- 84 Boeing P-26A Fr. \$48. 90 Waco Taper-Wing \$48.
- 69 Waco C-6 Cabin \$36. 75 West'd Lysander \$32.
- 64 Beech C17-B Stag \$38. 100 West'd Lysander \$49.
- 96 Beech C17-B Stag \$49. 57 Ford Trimr 4-AT \$36.
- 55 Lock. 11 Electra \$30. 76 Ford Trimr 4-AT \$48.
- 82 Lock. 11 Electra \$40. 114 Ford Trimr 4-AT \$65.
- 62 Stinson T/W SR7 \$18. 96 Bellanca Aircruis \$40.
- 81 Stinson T/W SR7 \$26. 93 Loening C-2 Amph \$39.
- 62 Stinson T/W SR7 \$38. 58 Grum. J2-F Duck \$31.
- 59 Bristol Fr. F2-B \$20. 78 Grum. J2-F Duck \$56.
- 118 Bristol Fr. F2B \$45. 124 Lock Air Express \$48.
- 74 Turner's "Pesco" \$45. 62 Lock Air Express \$24.
- 56 Cur Warh P-40 \$24. 83 Lock Air Express \$36.
- 60 Vogt Corsair F4U \$35. 77 W-Wms 121 RedL \$48.
- 80 Vogt Corsair F4U \$69. 63 C. Seahawk F7C-1 \$45.
- 78 Lock Lightn'g P-38 \$38. 94 C. Seahawk F7C-1 \$57.
- 56 Rep. Sea-Bee Am. \$24. 108 Sikor S-38 Amph \$49.
- 74 Rep. Sea-Bee Am. \$39. 60 Boeing 100 Sport \$36.
- 70 Piper J-3 Cub \$29. 90 Boeing 100 Sport \$49.
- 106 Piper J-3 Cub \$39. 72 Northrop Gamma \$48.
- 98 Lock Hudson Bmb. \$38. 96 Northrop Gamma \$75.
- 63 Grum F6F Hellcat \$28. 90 Stins' A" Low 3/M \$56.
- 77 Boeing B-17G Fort \$35. 60 Stins' A" Low 3/M \$42.
- 103 Boe. B-17G Fort \$55. 120 Stins' A" Low 3/M \$82.
- 68 Westl Whirlwind \$32. 78 Consol. Cat. PBYS A \$42.
- 68 N. Amer. Navlion \$39. 104 Con. Cat. PBYS A \$56.
- 68 B. Bonanza V-Tail \$39. 65 M. China Clipper \$65.
- 77 Luscombe Sedan \$25. 97 M. China Clipper \$75.
- 72 N.A. B-25 Bomber \$49. 62 Curtiss NC-4 \$59.
- 65 M. Marauder B-26 \$49. 94 Curtiss NC-4 \$69.

--- AFTER PRICE INDICATES QUARTER SIZE GIANT PLAN ---

Over 1200 Others, 6" - 73"; All Patts. Incl. 50c Up.

Add 10% to all orders for shipping & ins., etc., to

USA, Can. & Mex. Elsewhere its 15% (25% if by air).

Pictorial catalog \$2.00 (includes Price List). Price list

section alone \$1.00. If by air, foreign, add \$1.00.

CLEVELAND MODEL & SUPPLY Co.

EDWARD T. PACKARD--AVIATION'S BEST FRIEND--SINCE 1919

10307A DETROIT AVE. CLEVELAND, OHIO 44102

Phone Service: (216) 961-3600

CARDINAL

(Continued from page 57)

this with careful engineering.

Next, prepare the vertical and horizontal stabs for mounting to the fuselage. Cut very thin, lightweight ABS plastic tips from their sheets, sand them square and mount them to the stabs with thin double-sided tape. Mount the control horns to the rudder and the elevator. The horizontal stab must have two holes drilled on its center line (exact measurements are given for their location). Slide the stab into a slot in the rear of the fuselage and screw a wood screw into the top rear of the fuselage and through the rear hole in the stab. The rudder has two wires protruding from its base, and these are threaded on the ends. These pass through two holes in the top of the fuselage; the rear one passes through the front hole in the stab. These wires are then captured on the bottom of the fuselage by two plastic caps, securing the rudder and horizontal stab.

The pre-built wing panels are joined using a three-piece (plywood/balsa/plywood) dihedral brace and a generous amount of epoxy. Almost every wing failure I've ever seen on an ARF model has been caused by a poor center glue joint. When the wing has been joined, a small notch is cut in the center of the trailing edge to allow it to seat properly on the fuselage. Cover this cut and the center joint of the wing with white tape (supplied in the kit). Trim and mount the plastic tips to the wing with double-sided tape.

Next, install the radio/flight battery tray in the fuselage. The tray is designed to hold the flight battery and servos. There's an opening in one end that's the same size as a 6-cell battery pack. Two plastic clips snap into notches in the sides of the plywood tray in the opening. These clips hold the batteries securely, but allow them to be easily removed for charging. The other end of the tray has a cutout for the servos. The two Futaba micro S-133 servos fit with plenty of room to spare. Using screws, mount the tray to the four nylon posts. These posts (with the attached tray) are then mounted in the belly of the fuselage with four screws that come up through the bottom of the fuselage.

Since the Futaba MCR-4A is an integrated speed control and receiver, the entire unit takes up less space than two separate units. It's also lighter, so it must be mounted as far forward as possible to achieve proper balance. The radio on/off switch and the motor arming switch are both mounted through the fuselage's left

(Continued on page 94)

CARL GOLDBERG MODELS

Mirage

550

SPECIFICATIONS

Type: Sport electric trainer

Span: 54 inches

Weight: 40 to 46 ounces

Wing Area: 464 square inches

Wing Loading: 9.5 to 10 ounces per square foot

Power Req'd: Turbo 550 motor, 6- or 7-cell pack

No. of Channels Req'd: 2-3

Suggested Retail: \$79.99

Features: Kit includes Turbo 550 motor, switch harness and propeller. All-wood construction plus lightweight vacuum-formed plastic parts.

Comments: Very attractive model with ROG performance off prepared surfaces. Easy to build. Review kit contained many very hard balsa parts that should have been made of a lighter grade of balsa.

**This electric is
no apparition in
either looks or
performance**

by RANDY RANDOLPH

REVIEWING A KIT isn't easy. In theory, the likes and dislikes of the reviewer should be set aside and the project looked at from the viewpoint of the "average modeler." However, just as with the aircraft seat that was designed for the "average pilot," this approach satisfies *no one*, since the "average" pilot simply doesn't exist! This review will be based entirely on my personal preferences, so it will, at least, satisfy *me*.

Electric-powered airplanes are everywhere, and they're getting more popular as manufacturers continue to produce kits that offer good performance and good looks. The Mirage 550 is an example of the trend away from powered gliders to the more conventional aircraft



types that have made R/C flying an accepted sport. By offering a good-looking, reasonably priced airplane, complete with motor, Carl Goldberg Models* is continuing the policy of satisfying modeler demands that started with the first Falcon kit many years ago. The Mirage 550 may very well be the start of another long-lived design concept.

THE KIT: While most kit boxes are about 36 inches long, the Mirage comes in a box that's over 4 feet long! No, this isn't an 8-foot airplane, or even a 6-foot job. The extra length is taken up by the motor and its har-

(Continued on page 73)

MIRAGE 550

ness in one compartment and the molded plastic cowl and wheel pants in another. The third, and largest, compartment contains the die-cut balsa and plywood, sheet and spar stock, as well as a dandy hardware package. Plans are also included, along with an especially fine instruction book. Inserted in the instruction book are a sheet of decals, a parts order form and a quiz that lets you to tell Goldberg just what you think of the kit. There's also a form you can send in for a \$1 deal on Super Jet.

Typical of Goldberg kits, the plans are well drawn and full of information. The 80-page instruction book covers everything from hatching the egg to leaving the nest. The building instructions are so good that you'll want to keep them for future reference.

Now that the box is open, let's build the thing.

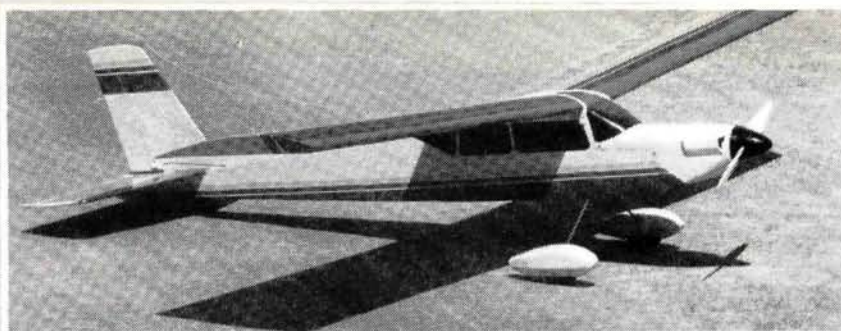
CONSTRUCTION: The tail surfaces come first, and these consist of a built-up fin and stab with solid rudder and elevator. The arrangement of an extra fin plan right beside the stab makes it possible to build both at the same time. Nice thinking! With just a little sanding to smooth out the joints and some cheating of the tip outlines, the die-cut parts fit fairly well. When using the instant glues, it's absolutely necessary to have good, tight-fighting joints (hence the extra sanding).

Some years ago, Goldberg had trouble with a kit that tended to shed its wings during abrupt maneuvers. That shouldn't be a problem with the Mirage wings: The spruce spars have webs, plus top and bottom leading-edge sheeting with an extra-wide sheet on the top followed by cap strips. And the center joint is wrapped with fiberglass cloth!

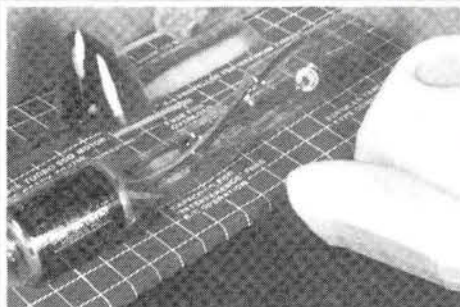
The leading and trailing edges were machine-shaped but, unfortunately, warped! Also, the leading edges are big in cross section and those in my kit were very hard balsa. It took two days of soaking and forming to get them straight enough to use. This is a problem with most machined balsa parts, because the internal stresses in the wood are released by the shaping, and this frequently causes warps that are difficult to remove.

The die-cut ribs were very good, but even so, it's a good idea to pin ribs to-

(Continued on page 119)



The Mirage 550 ready to go.



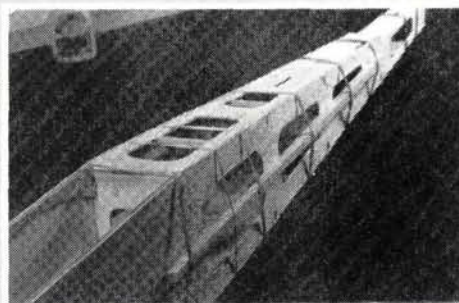
This kit includes the basics, plus motor and wiring harness, propeller, spinner and all the hardware—even for the third channel.



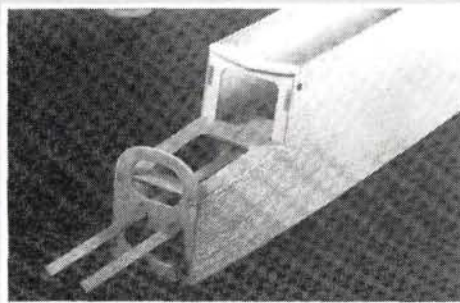
The 80-page instruction manual is a real keeper. It can be referred to often, even when building other kits!



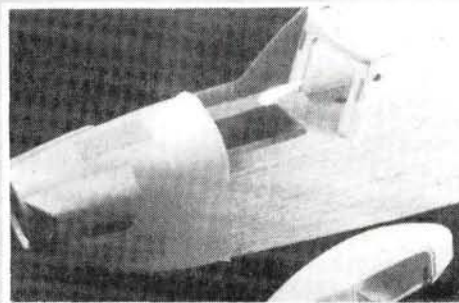
Parts fit well, and an extra fin plan is provided right next to the stab plan, so both can be built at the same time without changing positions.



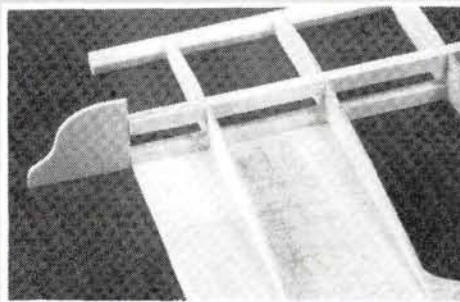
Using the pushrod stock for fuselage alignment is a neat trick that works! Fuselage easily came out nice and true.



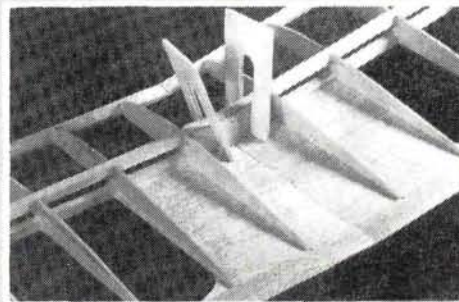
Motor mounts are at an angle (as they should be) to fit the motor. All plywood parts fit well after only a little sanding to smooth the edges.



Plastic cowl parts fit like a glove, and they're easily painted to match the Black Baron film used for covering.



Typical of Goldberg kits are jigs for almost everything that a jig will help build! This one sets the dihedral angle of the wing-root spars and the leading and trailing edges.



Also typical of Goldberg kits are the plywood clamps, which are provided to ensure good contact between spars and dihedral braces at the wing center.

NEW MONTHLY HELICOPTER SECTION

76 Mini-Review: GMP Legend

80 Engine Review: Webra Speed .50 Heli

84 Heli Quick-Look: QuickSilver Conversion

86 Graphical Radio Set-Up Method

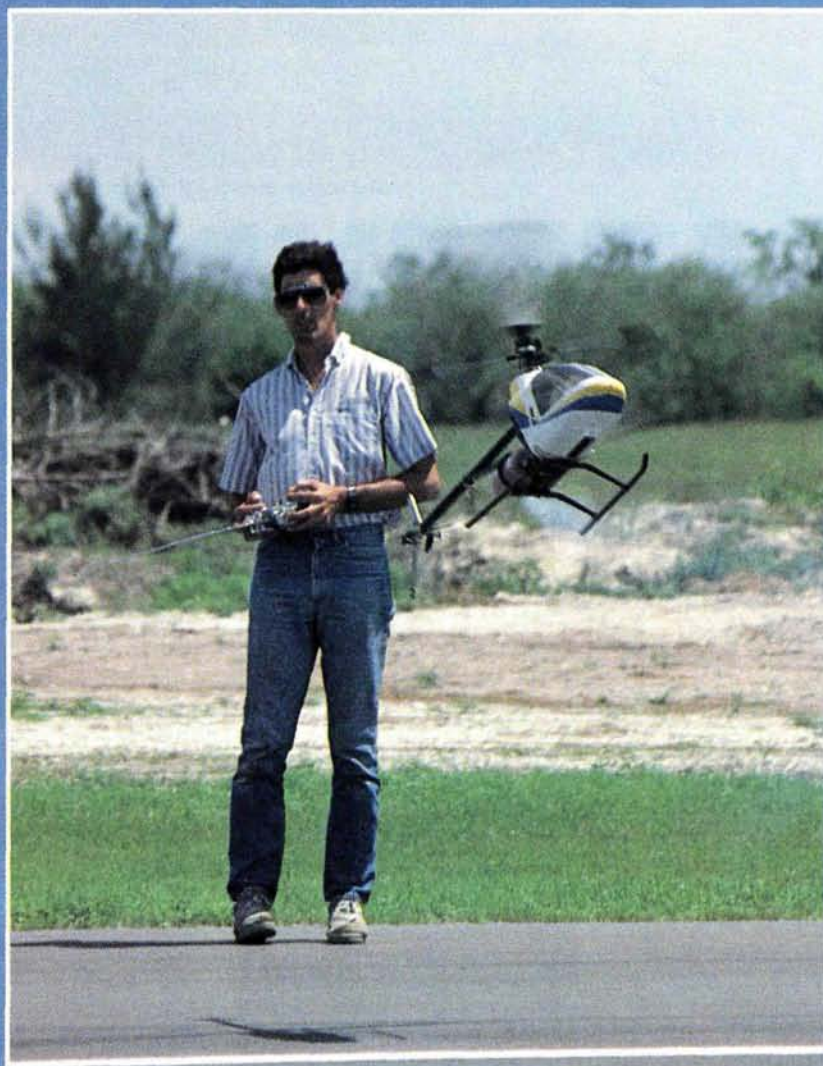
89 Rotary-Wing Roundup

91 Helicopter Challenge

HERE WE ARE AGAIN! We've made it to issue number two, and the response has been outstanding. I don't know whether there's just more going on in general in the R/C helicopter arena, or whether we're more aware of it since embarking on this adventure, but a lot of former fixed-wing fliers are trying heli flying and enjoying it.

I recently joined IRCHA (International R/C Helicopter Association, 6225 Taylorsville Rd., Dayton, OH 45424) to hook up with other heli fliers (accomplished fliers, and novices like me) in the hope that I'll accelerate my learning and understanding. The organization is growing, and membership gets you a card, a patch and a monthly newsletter devoted strictly to heli happenings that has so far included club listings, a calendar of events, information on heli products and a definition of the group's objectives. For more information, contact Don Chapman at the address shown.

This month, we have a mini-review of the Gorham Legend, and this precedes next month's full-blown "Pad and Bench Review" prepared by our own "Helicopter Challenge" ace, Craig Hath. Ron Farkas provides a practical method of setting up some of the newer, high-tech radio systems by presenting a visual approach to establishing the required inputs. What you think you need might not always be the case! Paul Tradelius installs the Miniature Aircraft Quicksilver

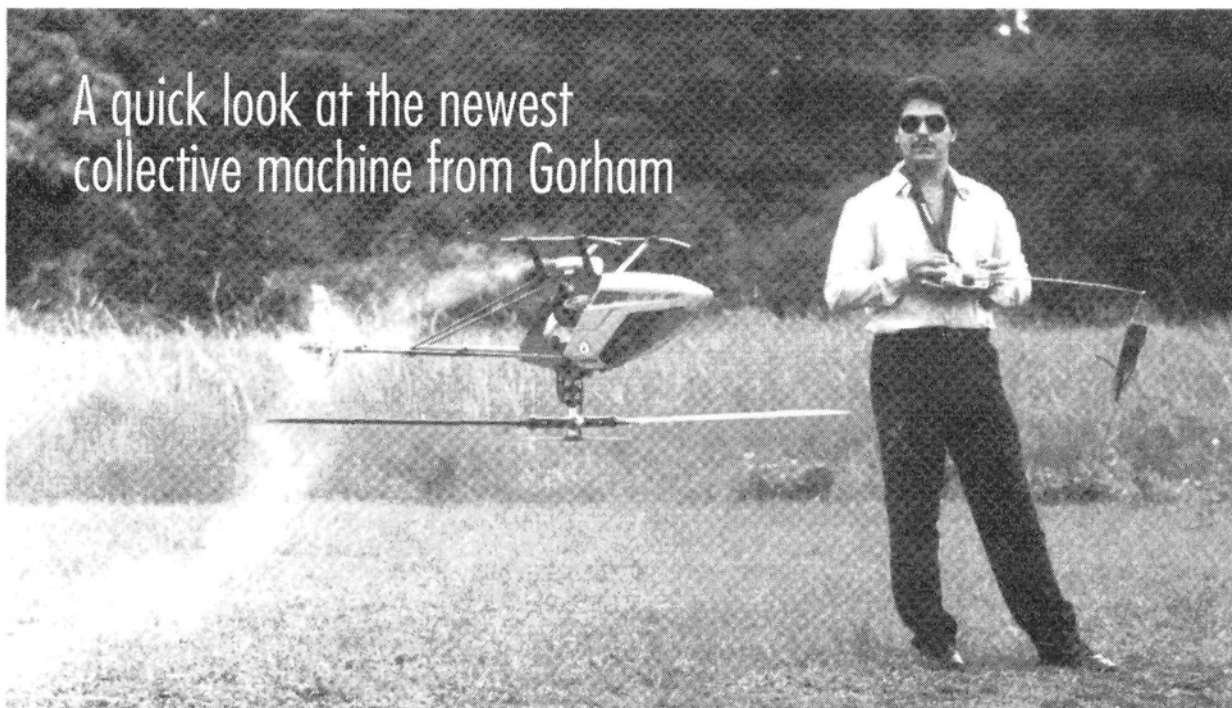


conversion and reports his findings.

Coming next month...the first R/C heli flight across Long Island Sound, some body conversions and radio reviews. Keep the skids down!!

Rich

A quick look at the newest collective machine from Gorham



Tim makes inverted flying look easy. A high-quality machine like the Legend helps.

GMP LEGEND

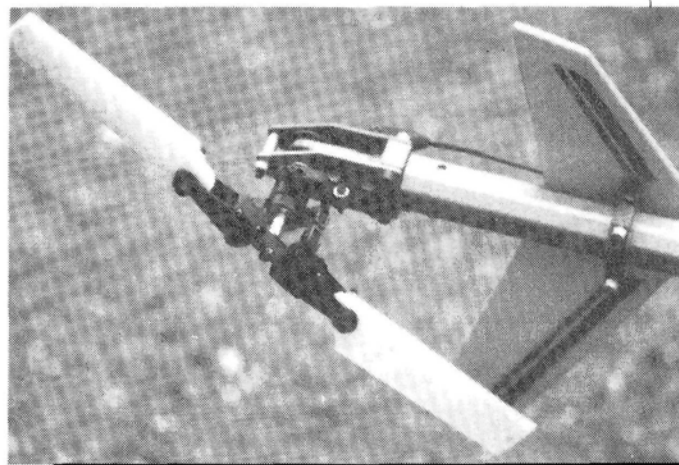
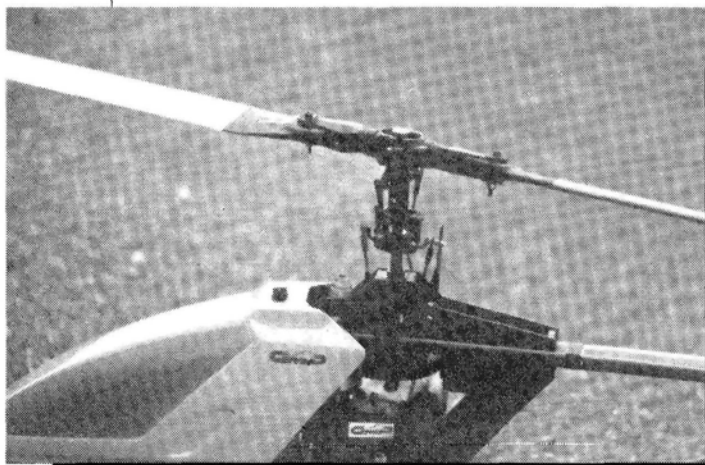
by TIM DIPERI

IT'S OBVIOUS THAT John Gorham and his staff have been very busy. Many hours have been spent at the drafting table and at the flying field, and the result is the new GMP Legend. The Legend incorporates the uncom-

plicated engineering features with which GMP owners have been comfortable for years, yet its many new features classify it as a helicopter for the '90s. One of the Legend's many beauties is that it can be tailored in many custom configurations to meet anyone's needs.

The Rotor Head

Although the Legend is offered with any of the well-proven GMP heads, it comes standard with a Delta-3 flybarless main rotor (see Fig. 1). Delta-3-type rotors have been talked about recently, because they automatically compensate for wind effects or when recovering from maneuvers. They do essentially the same job



Left: Both rotor configurations were tried; flybarless shown here. Right: Tail rotor is toothed-belt-driven to reduce slippage. Hexagonal cross section of tail boom is evident.

as a flybar, but in a different way.

To illustrate how it works, let's say a gust of wind hits your helicopter and forces up the front of the rotor disc (this will tend to pitch the helicopter upward). When the advancing blade (don't lose me now!) reaches the 12 o'clock position, it's forced up. Since the control rod to that blade hasn't changed position, however, the effect will reduce the pitch on that blade, which will automatically correct the machine to its original attitude.

To decrease sensitivity and to make the setup more conventional, there's an intermediate lever from the swashplate to the main blades. In addition, this technique reduces stress on the roll, pitch and collective servos.

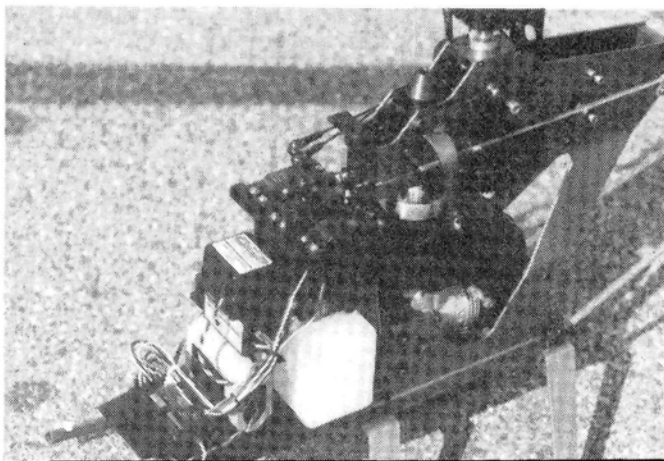
The Delta-3 hinged main rotor, along with weighted, CG-corrected (already done for you in the kit), yields a machine that hovers solidly and is extremely aggressive during high-speed aerobatics. (Note: The Legend fits inside GMP's scale fuselages.)

The Tail Rotor

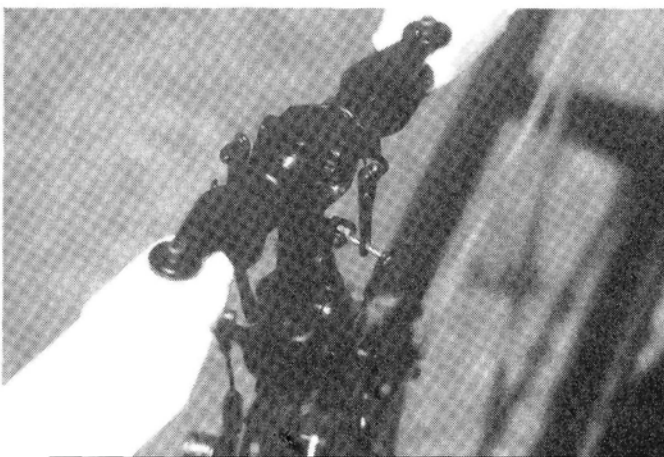
Also standard on the Legend is a belt-driven tail rotor, which we've tested by using it to pull a truck! You might ask, "Why go to a belt-driven tail rotor?" Well, this tooth-type belt-driven tail is lighter and has fewer parts than a shaft-driven tail. In addition, speeding up and/or output direction will be easier than when using a shaft-driven tail rotor.

The considerable reduction in weight is achieved by replacing four bearings, two steel gears and a large collet with two bearings and a light-toothed pulley. Simple physics tells us that to compensate for weight at the tail, we need almost *four times* as much weight in the nose.

Another nice feature of the tail is its slop-free pitch control, and to improve the tail rotor, GMP also uses three bearings to support each tail-blade holder. And this is all supported by an extremely strong octagonal cross-section tail boom instead of the conventional cylindrical tail. There's virtually no play in the tail blades, and when you're flying the helicopter, this is



Equipment installation is neat, with adequate space for all required components.



Close-up of main rotor head shows linkages and distinct absence of flybar and paddles.

very obvious.

Other Interesting Features

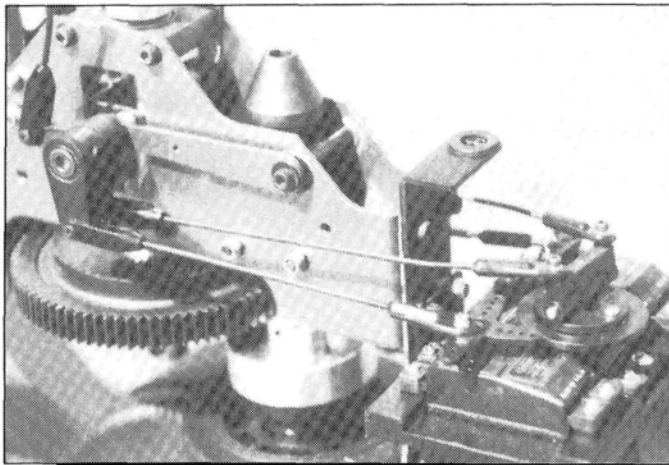
- Slide-on canopy: Up until now, almost all helicopters used canopies that were bolted to a block of wood in some way or another. Similar to Hirobo's Shuttle, the Legend is the first .60-size helicopter to incorporate a slide-on canopy.
- Push-pull roll control: To ensure precise roll movement, a push-pull configuration is used. To eliminate unwanted friction, the two "L" levers used for this are supported by two bearings.
- Refreshing gray: For the first time in years, a helicopter is offered in a color other than black. The Legend comes with an extremely good-quality gray anodized finish.
- Non-degrading swashplate anti-rotation

(Continued on page 78)

bracket: Many helicopters use a lever-type anti-rotation bracket to prevent the swashplate from rotating. This isn't as good when raising and lowering the swashplate to achieve pitch changes, because as we raise and lower the swashplate, we also push it and pull it (right-angle-triangle theory). By using a frictionless

rail to guide the swashplate up and down, the system used on the Legend ensures this can't happen.

● No composites: It seems as if several manufacturers are tooling up to make many parts of plastic, but the Legend continues the successful GMP tradition of using almost all metal parts. (Plastic is used for the main gear, the canopy and other parts.)



Servo installation, main gear, control linkage and vertical starting cone are all evident in this photo. High quality throughout.

Assembly

You might notice that the kit doesn't look the same as other GMP kits. It's packaged extremely well, and the instruction manual is a well-written, four-part modular system. The four parts are: Basic Assembly; Main Rotor Blades; Controls Setup; and How to Fly. For each building step, there's a detailed description of the assembly and an exploded-view diagram showing the names and numbers of each part. I

(Continued on page 126)

X-CELL *in flight*

Flash!

X-CELLS WIN: Atlanta FAI, Michigan FAI, and US Team Trials

At flying fields around the world, X-CELL has become the dominate force in R/C helicopter sport and competitive flying. Discover what it means to own and fly the most responsive, stable, agile and reliable state-of-the-art machine in the sky. Discover X-CELL!

- Dual ball bearing washout control (.060).
- Stainless steel flybar with dual control arms, dual ball bearing support (.50 & .60), aerobatic paddles and weights.
- 20° pitch change capability.
- Composite blade supports with dual support bearings, single thrust bearing (.50 & .60) and integral control arms.
- Dual ball bearing Bell mixers (.50 & .60).
- Hardened steel, rolled thread pushrods.

- Hardened main shaft.
- Dual ball bearing bellcranks (.60 series).
- In-line swashplate with 4 point control and sealed bearing.



.30, .50 & .60 Series Helicopters

- Injection molded aerodynamic tail fins.

- Internal dual ball bearing slider pitch control.
- One piece tail blade holders.
- Rigid, fiber-filled counter-weighted tail blades with reflex airfoil.

- Custom aluminum tailtube and support and "Shur-Grip" mounting system.
- Dual ball bearing bevel gear at front tail drive unit.

- Machined 3mm servo supports with all necessary cutouts.
- Machined fuel fittings.
- Unique "tilt-cabin" canopy permits adjustments without removal.
- Tuf-Strut II landing gear system.

- Fully supported dual autorotation system.
- Hardened 2mm, anodized side frames.
- Self-aligning fan hub system.
- 1-piece machined and tapped motor mount for side or rear exhaust (.50 & .60).

miniature aircraft USA

2324 North Orange Blossom Trail • Orlando • Florida 32804 • (407) 422-1531 Fax (407) 648-8609

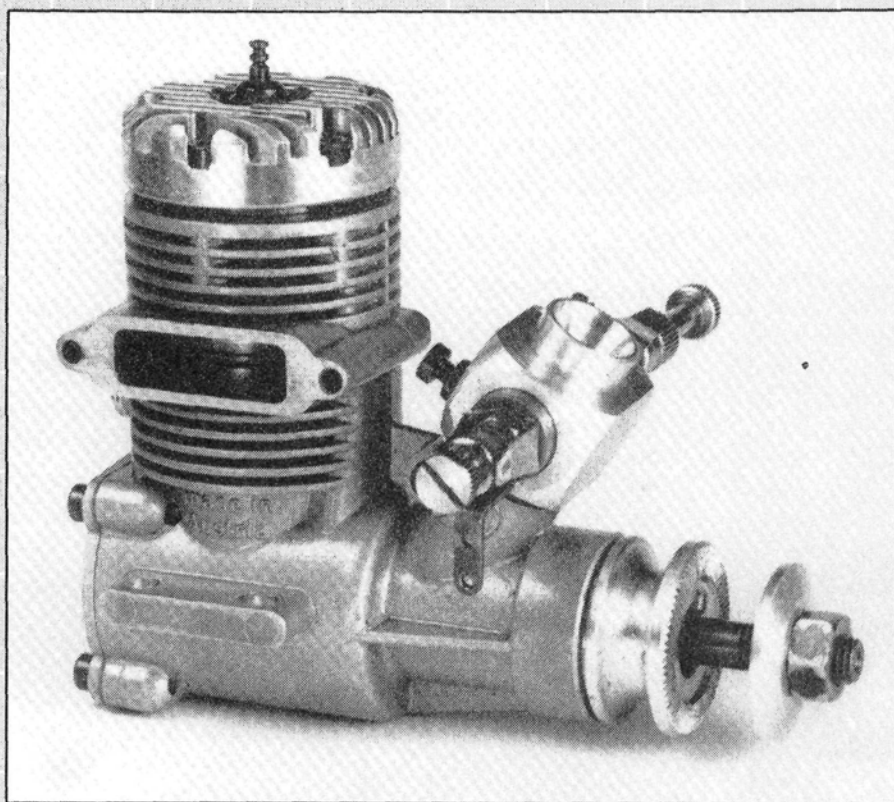
ROTORSPOUT MAGNA-PIPE JMW GYROSENSOR TUF-STRUT I & II THE ALERT WEBRA SCALESPOUT

by MIKE
BILLINTON

MADE IN AUSTRIA by Webra Modellmotoren and sold in the U.S. by Hobby Dynamics*, the large-bore Webra Speed 50 is achieving quite a reputation among helicopter pilots. Lurking inside a .40 crankcase, its popularity results from its high power/weight ratio, its compact dimensions and (if my tests are a good guide) its high performance levels.

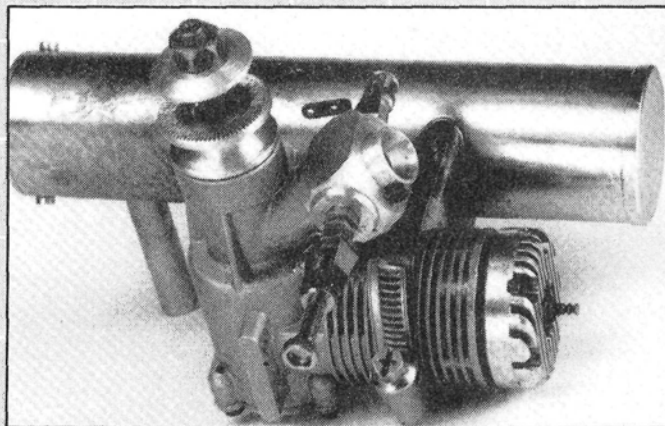
In general, attempting to pack bigger engines into smaller areas leads to reduced reliability and hotter running temperatures. However, demands for weight reductions often pressure manufacturers to bore/stroke some of their existing engines rather than produce yet another new set of expensive castings. Typical well-known examples are ducted-fan units such as the O.S. 77 and OPS 80 engines, which are virtually .65-cubic-inch engines packed out almost to bursting point. One has only to compare the 22 ounces of that OPS 80 aircraft engine with the 44 ounces of the only slightly larger capacity, but waterborne, engine—the OPS 90 marine racing engine—to comprehend the stark differences. One humorous suggestion is that the marine racing engine is built that heavy and strong to allow temporary underwater travel at 25,000rpm without the motor bursting hydraulically.

Nevertheless, it's surprising just how reliable and unfussy the performance of these lightened aircraft engines can be, and the Webra 50 proved to be a



WEBRA SPEED .50 HELI

A German powerhouse—perfect for when a .40 just isn't enough!!



Schluter expansion-type muffler is a practical unit that suppresses sound effectively.

very consistent performer—under dynamometer test conditions, at least.

The Webra 50 has no "heat-sink" head because this engine is intended to fit a Schluter helicopter, the frame of which incorporates a built-in heat sink.

Mechanical Details

The Webra Speed 50 features standard ABC Sch-

SPECIFICATIONS

DIMENSIONS & WEIGHTS

Capacity: .5104 cubic inch (8.364cc)

Bore: .907 inch (23.05mm)

Stroke: .790 inch (20.06mm)

Stroke/Bore Ratio: .871/1

Timing Periods:

Exhaust - 154 degrees

Transfer - 120 degrees (angled up 10 degrees)

Boost - 110 degrees (angled up 50 degrees)

Front Induction - Opens - 36 degrees ABDC

Closes - 44 degrees ATDC

Total period - 188 degrees

Blowdown - 17 degrees

Combustion Volume: .85cc

Compression Ratios: Geometric - 10.84/1

Effective - 8.01/1

Exhaust-Port Height: .227 inch (5.78mm)

Cylinder-Head Squish: .013 inch (33mm)

Cylinder-Head Squish Angle: 10 degrees

Squish-Band Width: .168 inch (4.27mm)

Carburetor Bore: .307 inch (7.82mm)

Crankshaft Diameter: .5902 inch (15mm nominal)

Crankshaft Bore: .378 inch (9.62mm)

Crankpin Diameter: .2162 inch (5.5mm nominal)

Crankshaft Nose Thread: .250 inch x 28TPI (1/4 UNF)

Wrist-Pin Diameter: .196 inch (5mm nominal)

Connecting-Rod Centers: 35mm

Engine Height: 3.38 inches (86mm)

Engine Width: 1.97 inches (50mm)

Engine Length: 3.34 inches (85 mm)

Mounting-Hole Dimensions: 42x18mm with 3.5mm holes

Width Between Bearers: 1.346 inches (34.2mm)

Ex. Manifold Bolt Spacing: 39mm (3mm bolts)

Frontal Area: 5.4 square inches

Weight: 23.75 ounces (362 grams)

Silencer Weight: 5.95 ounces (169 grams)

Crankshaft Weight: 2.3 ounces (65 grams)

Piston/Rod Weight: .50 ounce (15 grams)

PERFORMANCE

Max. BHP: 2.02 @ 18,300rpm (OPS pipe/5-percent nitro)

1.75 @ 20,400rpm (open exhaust/5-percent nitro)

1.56 @ 19,586rpm (Schluter silencer/5-percent nitro)

Max. Torque: 120 ounce inches @ 15,300rpm (OPS pipe)

116 ounce inches @ 12,600rpm (open exhaust)

103 ounce inches @ 13,120rpm (Schluter silencer)

RPM on Standard (Fixed-Wing) Propellers

| | Open Ex. | Schluter Silencer | OS46 Pipe | OPS60 Pipe |
|-----------------|----------|-------------------|-----------|------------|
| 15 x 6 Airflow | 7,220 | 6,660 | — | — |
| 13 x 6 MK | 9,630 | 9,168 | — | — |
| 12 x 6 Graupner | 11,460 | 10,600 | 11,200 | — |
| 11 x 6 Graupner | 13,050 | 12,623 | 12,464 | — |
| 10 x 6 MK | 14,180 | 13,673 | 13,710 | 14,820 |
| 9 x 6 Master | 17,490 | 17,285 | 16,200 | 18,350 |

PERFORMANCE EQUIVALENTS

BHP/Cubic Inch: 3.95

BHP/cc: .24

Ounce Inch/Cubic Inch: 235.1

Ounce Inch/cc: 14.35

BHP/Pound: 2.53

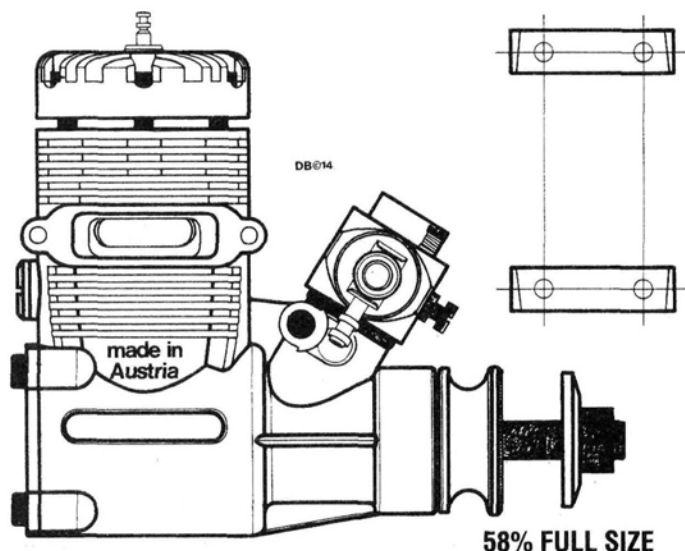
U.S. Distributor: Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

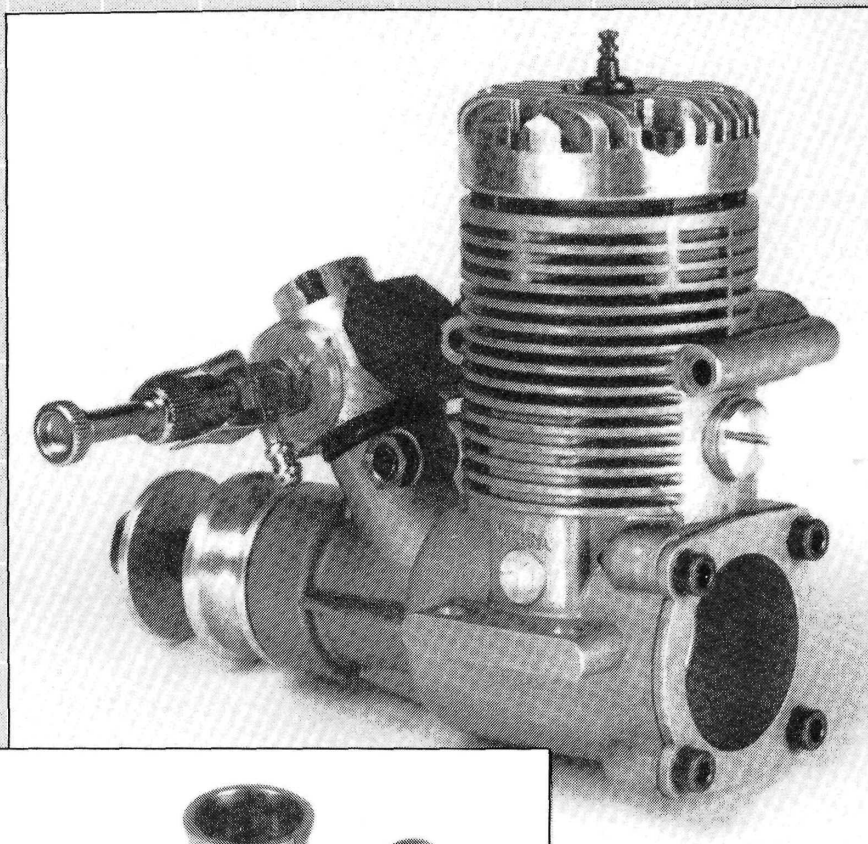
nuerle-ported technology, with a well over-square stroke/bore ratio of .87/1. The piston bore of .907 inch certainly looks massive through the 154-degree timed exhaust port. Supporting this large piston is a surprisingly small connecting-rod big end. This gave

no problem whatever during testing, however, and its smallness made more sense when the combined piston/rod weight proved to be a very light .5 ounce. This probably also explained why vibration levels had been quite low throughout the rpm test range.

A solidly constructed, front-inducted crankshaft is housed in a finely produced one-piece die-cast crankcase and has a fairly standard 188-degree total opening period. The flywheel or propeller driver is fixed to the shaft with a Woodruff key. The cylinder-head combustion shape is the normal "bowler hat" and set at a fairly close squish clearance of .013 inch. The resultant effective compression ratio is pitched at a comfortable 8:1, which should allow reasonable, trouble-free performance either on low- or high-nitro fuels, though only 5 percent was used during this test.

The carburetor is Webra's reliable twin-needle (TN) type, which continues to give good, predictable





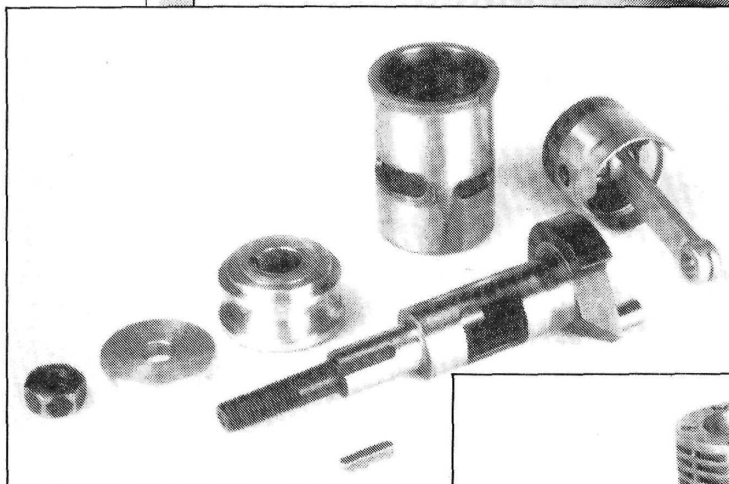
well as the open-exhaust ones above 18,000rpm. At high rpm, the loss equates to around 900rpm and 10 ounce/inch torque on a given load.

Test Results

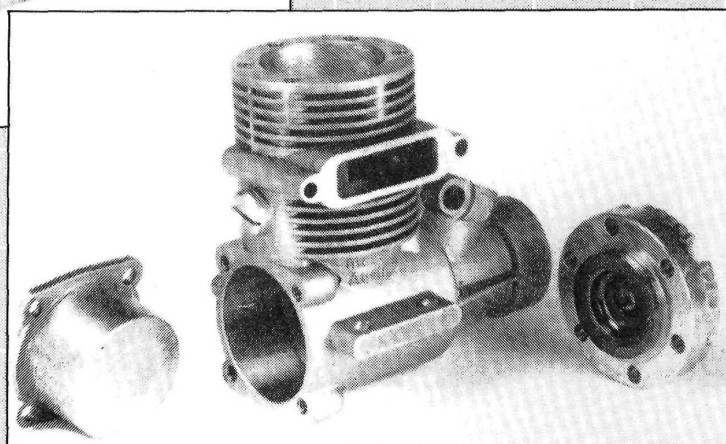
Open exhaust: Fuel: 5-percent nitro, 10-percent castor, 10-percent ML70 synthetic; OPS 250 plug. Webra's instructions suggest that "at least 20 percent oil" should be used, so a 50/50 mix of castor and synthetic was used here. They make no comment on nitro levels, so I added only 5 percent. As usual, the rest of the fuel was methanol. The graph shows the wide-ranging power available in open-exhaust form, though it's unusable because of restrictions on sound levels.

Schluter silencer: Fuel/plug as in previous test. This piece of equipment is designed for the Webra 50 and the associated helicopter and, contrary to information received, it doesn't seem to be any sort of tuned device. In fact, partially dismantling it revealed that it's a quite normal back-pressure or expansion-chamber style, and this was also shown by the power-

Above: Screw at back of case is for extraction of wrist pin to allow total disassembly of engine.



Above: Light piston and hefty crankshaft are noteworthy. Woodruff-key fitting for prop driver makes assembly easy. Right: After test, combustion chamber had good, light brown color, which indicated correct squish and compression-ratio setup.



control throughout; the only unusual finding was the noticeable power difference between throttle positions $7/8$ open and fully open. This loss amounted to approximately 15 percent, and initial failure to spot this necessitated a complete re-run of most of the Schluter silencer figures, as

graph result. The fuel-consumption curve appears to confirm this, too, as it shows the expected better fuel economy resulting from the use of this style of silencer compared with the expected higher open-exhaust fuel consumption. Given the quieting effect of the steel Schluter

silencer, I was surprised to find that it didn't suffer from the usual marked fall-off in power at high rpm. In fact, at 23,000rpm, power levels were back on a par with the open-exhaust figures.

O.S. 46 tuned pipe: Set at 360mm from plug to first maximum diameter; fuel/plug as in first test

Although this tuned pipe seemed to be an appropriate size, attempting to use it was an error. The overall result has been omitted from the graph, as figures were depressed to below even those of the Schluter silencer. Covering rpm from 9,000 to 16,000 showed clearly that the pipe was really acting as a severely restricted back-pressure silencer. Admittedly, a shorter pipe would have improved matters slightly, but logically, a larger pipe definitely seemed necessary.

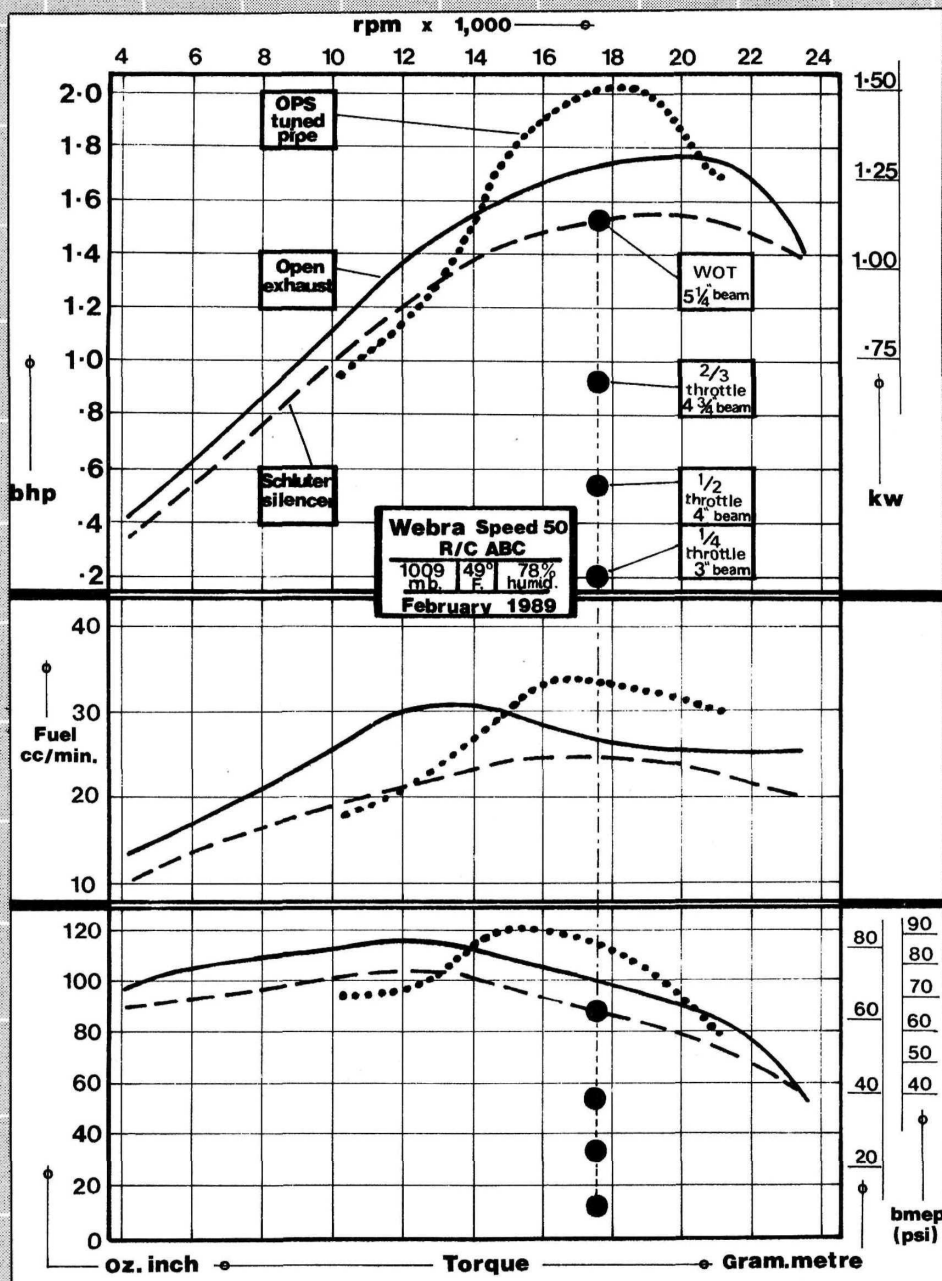
The dampening effect of having a tuned-pipe volume that's too small has been noted previously.

OPS 60 tuned pipe: Set at 300mm from plug to maximum diameter; fuel/plug as in first test. This pipe was a clear improvement, with a significant resonant point in the 16,000 to 18,000rpm area. This resulted in the maximum hp and torque found during the tests, and it represents a big advantage for those using the Webra 50 heli engine in out-and-out speed runs. Further shortening of the pipe—say to 280mm—would raise hp and rpm levels a little more.

Reduced-Throttle "Spot" Points

The points on the graph were recorded when the

Schluter silencer was fitted. They show the ability of the carburetor to provide correct fuel/air mixture when the throttle is closed, even though rpm remains constant (this is basically the way in which helicopter engines operate when allied to variable-pitch blades). Because of the high inertia of a helicopter blade, the machine's speed changes upward or forward (except in the case of non collective-pitch-equipped machines) are affected by pitch changes rather than by difficult-to-achieve rpm changes. So, with rotor and engine rpm remaining relatively constant at differing throttle and pitch/load settings, it's clear that



(Continued on page 131)



Distinctive, clean lines are certainly more aerodynamic. The nice part is that no mechanical mods are required.

Paul and his Quicksilver. Swoopy lines belie its traditional pod-and-boom configuration. Some difference!



by PAUL TRADELIUS

A SUPERSONIC-looking fiberglass fuselage for the 60-size version of the X-Cell was released several months ago by Miniature Aircraft USA*. Called the QuickSilver, this extremely light fuselage was designed by Ted Schoonard to mount over the existing X-Cell mechanics with a minimum of work and give a maximum of good looks.

One of the first things you'll notice about the QuickSilver is the excellent fiberglass work. Mine was practically flawless, except for some small pinholes (which I had to fill) and a small ridge down the middle where the two halves are joined (which I had to sand). To make filling easier, Miniature Aircraft now includes lightweight pinhole putty with its QuickSilver kits. Rounding out the kit is a nice set of instructions (with photos and diagrams) and a small bag of necessary additional parts.

I have to apologize to Miniature Aircraft's Walt and Ted Schoonard, because I didn't start assembling the QuickSilver as soon as I got it. It's not that I didn't want to add this fuselage to my X-Cell, but to do it justice, I was waiting for a

MINIATURE AIRCRAFT QUICKSILVER CONVERSION

This new body turns pod and boom into a slippery, more aerodynamic shape

time when my worktable was clear enough for a major project. But when I *did* get started, I was pleasantly surprised—this is not a major project! The QuickSilver has no internal structure or bulkheads, but merely slips over your existing X-Cell framework. I started one rainy evening after dinner, and after about four hours of easy work, the QuickSilver was a part of the helicopter and just waiting to be painted. If you've ever tried to add a fuselage to a helicopter, you'll appreciate just how quickly and easily this one goes on. (Maybe that's what the "quick" in QuickSilver means.) Let's take a closer look at the minor assembly required to change your X-Cell into something *really* special.

Obviously, the original canopy and the canopy support studs have to be removed. To keep the CG within limits, the battery pack is positioned in the QuickSilver's nose, and spacers are added between the landing skids and the frame to provide a little extra clearance for the fuselage. The corners of the tail-fin clamps are rounded to accept the fuselage, and blind-nuts are installed to make a clean-looking tail-fin arrangement. A U-shaped bracket is also added to the top rear of the side frames as a mounting support for the fuselage. And that's about it for changes to your X-Cell; not much at all!

The QuickSilver fuselage comes in three sections: a front section, a rear section and a tail cone. So the next step is to cut access and cooling holes in the front and rear fuselage sections. These cutout areas are plainly shown on the accompanying diagrams, and the fuselage has etched lines showing all the cutout areas. I used a Dremel cutting wheel and grinding attachment, which made the work quick and easy. For a really professional look, hand-sand the cutout areas with a block and fine sandpaper.

Next, fit the front and rear fuselage sections to the X-Cell. The rear section isn't joined at the bottom, so it's easy to pull the bottom fuselage apart slightly and slip it down over the existing tail boom. This section is held in place by the landing-gear bolts, a small screw going through the U-shaped bracket and the tail-fin assembly.

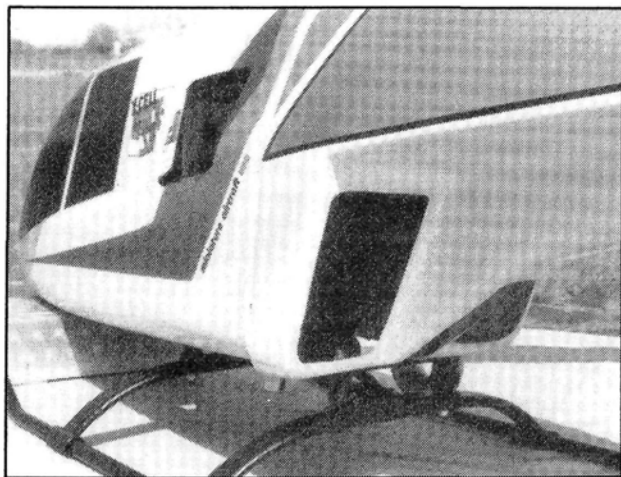
The front fuselage section has four small pins that mate to the rear section, and the two sections are pulled together by two 3mm bolts near the bottom of the fuselage. The front section also utilizes a standard X-Cell canopy latch that not only keeps it securely in position but also allows easy removal. As you can see, the whole QuickSilver fuselage can be removed in a matter of minutes. Although I haven't tried it, I think you could convert an X-Cell to a QuickSilver (or vice versa) at the field in 10 to 15 minutes.

I particularly like the small tail cone that's supplied with the QuickSilver kit. So many "fuselage" helicopters have an exposed tail-rotor gearbox, but Miniature Aircraft USA has made the effort to add a tail cone to completely enclose it, and this really enhances the machine's appearance.

All the work to this point can be accomplished in one evening; now you just have to finish the fiberglass. In the instructions, there are several recommendations on finishing techniques that not only produce a great-looking fuselage but also keep the weight to a minimum. I don't have an accurate scale to measure the weight gained by adding the QuickSilver fuselage, but I guess it's less than 1/2 pound.

But the real test of weight and performance is how the QuickSilver conversion feels in flight—and mine feels better. Because the QuickSilver has been added "over" the already

(Continued on page 132)



Left: Large outlets ensure proper cooling and look sporty. Right: Forward (removable) part of fuselage is aligned with pins that go into receptacles. Equipment access with section removed is great.

GRAPHICAL RADIO SET-UP METHOD

by RON FARKAS

Some ideas for improving your flying...
a kind of "graphic equalizer"

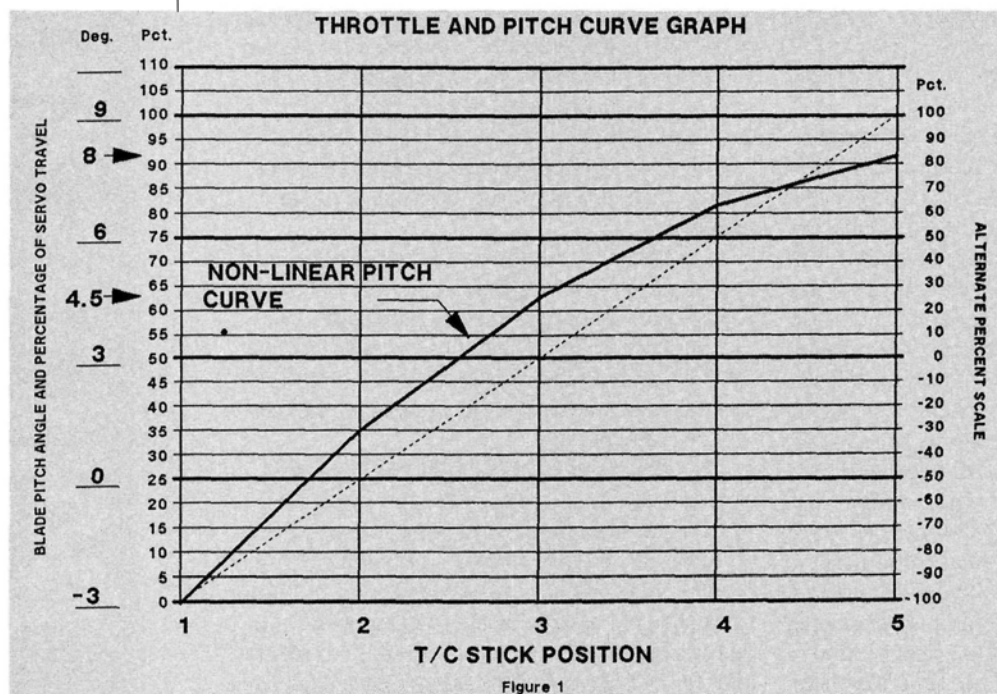


Figure 1

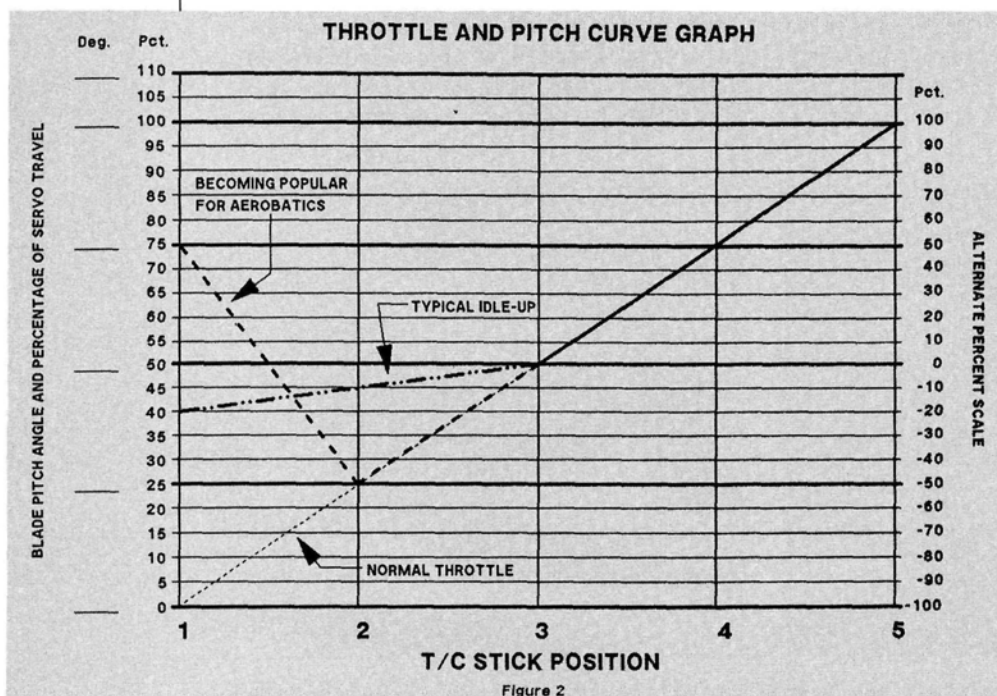


Figure 2

THIS ARTICLE DISCUSSES the use of graphs to assist in setting up throttle and pitch curves on a programmable helicopter radio system. Examples of the technique are shown in Figs. 1 and 2; Fig. 3 is a blank graph, so you can make photocopies for your own use.

Several recommended setups have already been described by various authors in this, and other, magazines, so I won't go into much detail about choosing points and percentages. Modern helicopter radios allow the experienced pilot to select several different collective pitch ranges for different tasks (e.g., -2 to +8 degrees for normal flying, -4 to +8 for aerobatics and -4 to +10 for autorotations). To maintain a fairly constant rotor speed throughout normal and aerobatic flying, the engine's throttle position must vary nonlinearly with respect to the stick position and, sometimes, it must even increase power at low stick. The actual shape of the curves varies, depending on your particular helicopter and your personal flying style.

My experience is based on the 7-channel Futaba* PCM 1024 system, but the technique should be applicable to other brands as well. The instruction manual contains tiny drawings that show how the functions work, but they aren't of much value for setting up your own system. The 9-channel transmitter actually has an itty-bitty graphic display on the control panel. However, what we really need is a life-size graph on which to draw curves *before* programming the settings into the transmitter.

Why draw the curves first? Well, for one thing, the drawing enables you to figure out what settings you need

THROTTLE AND PITCH CURVE GRAPH

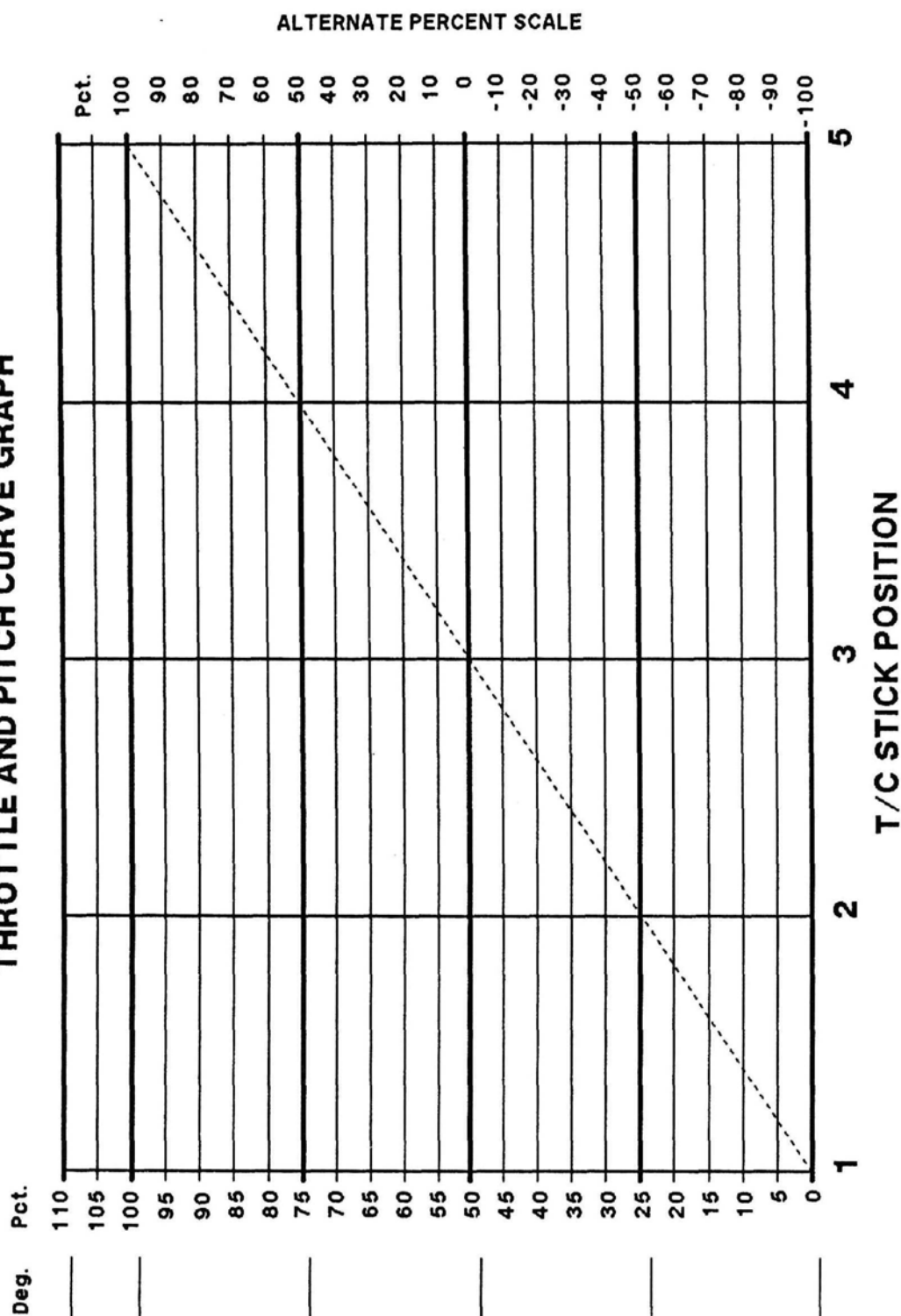


Figure 3

HELICOPTER SECTION

GRAPHICAL RADIO SET-UP METHOD

and to visualize what response you'll get. Of course, an alternative is to go out flying and to keep pushing buttons until you like the way the machine flies. Unfortunately, this could lead to a combination of settings that work against one another. The helicopter might fly OK most of the time, but never be *completely* right all the time. Additional random button pushing might even make matters worse. In other words, these fancy radios can get you into trouble if you don't plan ahead—at least for a setup that's a reasonable starting point. Then, after some experimentation, you can plot the result and verify that what you have is what you expected.

We should all recognize that the use of a programmable radio is no excuse for having an improper mechanical linkage setup. However, some, if not all, the collective pitch-curve nonlinearity can be programmed in, rather than using an offset servo arm to obtain differential travel. If you already have differential, then you can plot it as the baseline curve.

OK, let's try a graph for plotting a normal pitch curve with respect to the throttle/collective (T/C) stick travel. In Fig. 1, the horizontal axis shows the five stick positions that Futaba provides for programming points. The left vertical axis has scales for percentage of servo travel and for degrees of blade pitch. Note that the percentage scale goes all the way to 110 percent to accommodate the transmitter's endpoint adjustment range. The pitch scale is for you to fill in based on your mechanical linkage. Let's say that your linkage gives you full travel from a low of -3 to a high of +9 degrees. If your throw is essentially linear, you can arithmetically determine the pitch at intermediate servo positions. Alternatively, you can take actual measurements using a pitch gauge on your helicopter. The latter would definitely be required if your linkage already has differential throw. The basic linear T/C curve is indicated by the dotted line, and it shows that half-stick (position No. 3) only produces 3 degrees of pitch, but you probably want something like 4.5 for hovering. Also, full-stick would give 9 degrees, while you might expect your engine to be happier with only 8. So you draw a line that provides a relatively smooth curve through these points, thus determining the appropriate percentages to be programmed into the transmitter.

Now, if you're a real hot-stick pilot, you'll also want

different pitch curves for aerobatics as well as for autorotations. Just draw a couple more of these curves, punch in the data, and then go flying. That way, you can expect to be pretty close right from the start. Remember, though, that if you have to change the mechanical linkage for some reason, the curves should be re-drawn and the transmitter reprogrammed.

Setting the normal throttle curve is a very similar process, but you don't have to fill in the pitch scale. For setting idle-up and throttle-hold functions, there's an alternative scale on the right. Futaba's settings for these functions range from full-low (at -100 percent) to full-high (at +100 percent) throttle travel, with zero being half throttle. This is an interesting range, although I don't think that many fliers will opt for full-throttle autorotations. Fig. 2 shows a couple of sample curves for normal and idle-up functions.

One could also use such a graph to check the effects of hover throttle, hover pitch, endpoints, dual rates and so forth. Having the graph in pictorial form is the real value of the technique.

Here's a hint for those of you who have the older helicopter radios with trim pots instead of push-button programming. A digital pulse-width meter such as the Ace* Datamaster can be used to plot servo travel against stick position. During control set-up, you can use a Y-harness to plug the Datamaster into any receiver output that's in parallel with its servo. The read-out is in milliseconds rather than percent of travel, but it still corresponds to movement of the servo arm. A minor disadvantage is that the stick positions have to be judged by the eyeball method. You'll have to design your own graph paper.

So, now that we're done with the examples, it's time for you to try it for yourself. Find a copy machine and make a batch of blank graphs from Fig. 3. To satisfy your curiosity, you might want to plot what your present settings look like. If your curves are all wavy or zigzag, read the fourth paragraph again. Good luck, and I hope that your helicopters are all flying better next weekend.

**Here are the addresses of the manufacturers mentioned in this article:*

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Ace R/C Inc., 116 W. 19th St., Box 511C, Higginsville, MO 64037.

ALL STAINLESS STEEL 'HEAD LITE II'™

BEST GLOW PLUG CONNECTOR _____ Stainless Steel "HEAD LOCK"

BEST DESIGN _____ All Welded, No Solder, Acid Flux or Flexing Wires

BEST NiCad _____ Field Replaceable 1.2 AH SANYO or 1.5 AH PANASONIC

BEST QUALITY & GUARANTEE _____ MODEL PRODUCTS CORPORATION

BEST PRICE _____ St. #045-W/O NiCad or Charger _____ \$ 9.95

St. #040-With NiCad _____ \$ 15.95

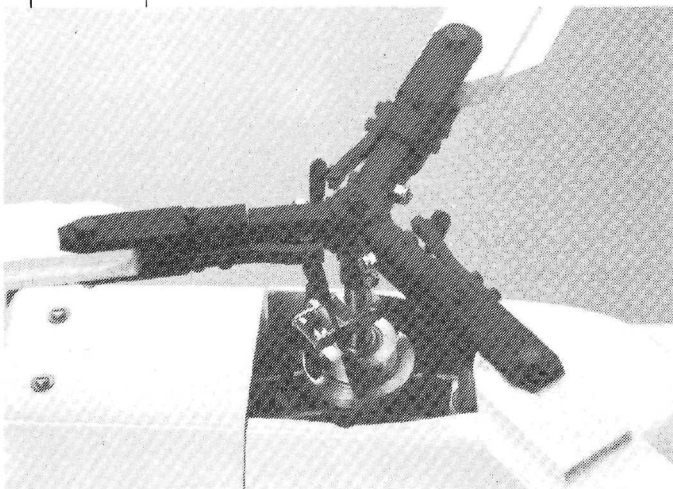
St. #041-With NiCad & Charger _____ \$ 25.95

If not available write direct,
add \$1.00 (\$2.00 outside US)

MODEL PRODUCTS CORP. P.O. Box 100, Allamuchy, N.J. 07820 (201)850-1580



ROTARY-WING ROUNDUP



SCHLUTER 3- AND 4-BLADE HEADS

Any scale-helicopter enthusiast will eventually look for a three- or four-blade rotor head. Schluter has offered several scale helicopters equipped with these heads, but they're now available separately, and they can be adapted to almost any brand of helicopter. Collective-pitch control is achieved by rais-

ing and lowering the swashplate, and since the rotor blades are controlled directly (without a flybar), there's more direct response to cyclic control.

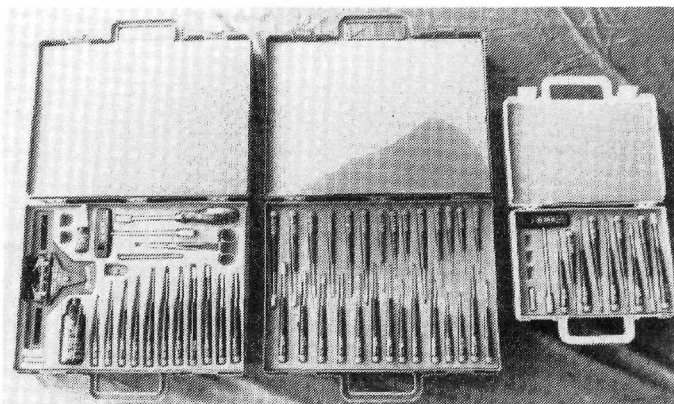
For more information, contact Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.

MINIATURE AIRCRAFT USA PRECISION TOOLS

Miniature Aircraft USA now markets some of the finest precision tool sets available for use on your R/C helicopter and on other jobs requiring small precise tools.

The Deluxe Tool Set includes four Allen wrenches, four nut drivers, two glow-plug wrenches, one Phillips screwdriver, two slotted screwdrivers, a universal pitch gauge, a flybar lock, a tail-rotor balancer, forceps, a ball-link tool, 2 ounces of Teflon lube, and Loctite.

The Multi-Tool Set includes seven slotted screwdrivers, three Phillips screwdrivers, seven Allen drivers and ten nut drivers.



The Master Tool Set includes four Allen drivers, three nut drivers, a T-handle glow-plug wrench, a ball-link tool, one slotted screwdriver and one Phillips screwdriver. Each kit comes in a handy carrying

case that has a sculpted-foam interior.

For more information, contact Miniature Aircraft USA, 2324 N. Orange Blossom Trail, Orlando, FL 32804.



E&G ENTERPRISES JET RANGER II

The Jet Ranger II fuselage from E&G Enterprises has an impact-resistant design of tough, flexible, .03-inch-thick, clear, vacuum-formed plastic. These bodies have a minimum weight and allow easy access to radio equipment without the need to use tools. The kit includes a long

starter belt, clear windows, a balsa tail fin and stabilizer, and all the necessary hardware. The illustrated step-by-step instructions make assembly easy.

For more information, contact E&G Enterprises, 23015 Del Lago #B-2, Laguna Hills, CA 92653.



JR SINGLE-STICK PCM

This 9-channel PCM system offers helicopter enthusiasts uncompromising control of their craft. The PCMs offer the ABC&W dual-conversion receiver that meets 1991 standards.

Among its other features are a plug-in transmitter RF module; electrical double trims; servo-reversing on all nine channels; end-point adjustments; dual-rate and exponential controls; anti-torque tail-ro-

tor mixing; and four, separate, collective-pitch-control systems. The system comes complete with four JRS-4001 servos, rechargeable transmitter and receiver batteries with charger, and all the other necessary equipment and hardware is included.

For more information, contact Circus Hobbies, 4105 Fieldstone, Champaign, IL 61821.

HOBBY LOBBY HUGHES FUSELAGE

This sharp-looking Hughes 500E fiberglass fuselage is now available for the Hobby Lobby Sport 500 Helicopter. The fiberglass tail boom, which replaces the original metal tail boom, is an integral part of the structure. For more information, contact Hobby Lobby International, 5614 Franklin Pike Cr., P.O. Box 285, Brentwood, TN 37027.



KALT CYCLONE II

The new Cyclone II is equipped with a newly designed rotor head called the K-5. This high-

performance single-axle head has solid hovering characteristics and outstanding aerobatic capabilities. The Cyclone II also has a new, eye-catching, aero-

dynamic-looking body. It comes with a Bell-Hiller mixer; a rear-mounted gyro compartment; pre-balanced, finished, main- and tail-rotor blades; and there are no wooden parts to paint. The kit is almost complete, needing only a radio, a gyro and an engine. The pre-assembled Cyclone II is packaged ready for radio installation, so it's ready for flight in approximately 2 to 3 hours.

For more information, contact Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.



Helicopter Challenge

by CRAIG HATH

I'VE OCCASIONALLY mentioned the need for a national helicopter organization to interface with the AMA and to organize and plan events like aerobatic competitions. One has now been formed, and its members have taken the idea a few steps further. The International Radio Controlled Helicopter Association (IRCHA) accepts members who are interested in all phases of R/C "helicoptering," and it's dedicated to becoming an association of enthusiasts who promote *only* R/C helicopters. To quote from the association's membership application:

"Our first goal is to get organized so we can ...

- know who shares our enthusiasm for helicopters

- communicate our thoughts and wishes to one another

- share our technologies, tips and experiences
- raise our level of proficiency in building, flying, or competing

- learn what's happening ... contests, fun flies, new helicopters, or anything else of interest pertaining to helicopters

- spread the fellowship we share as helicopter enthusiasts

- have a collective voice with which to air our opinions and wishes to those who need to hear the voice of helicopter enthusiasts."

Overall, the IRCHA should be a great sounding board for modelers who want to see R/C helicopters grow and prosper, and joining this group should be a good investment in our future. Annual dues, which are \$35, include a club membership card, an embroidered patch and a subscription to the monthly newsletter, *The Bulletin*. I hope this organization will help generate interest in organizing competitions around the country, especially on the West Coast. Presently, there are only fun flies in the west, and that's fine until you want to compete seriously. This isn't to say that the U.S. hasn't been a major influence internationally, but producing new talent for our country's international teams could make us more formidable in aerobatic and scale competitions. If competition isn't your cup of tea, the IRCHA is still a great place to find out what's going



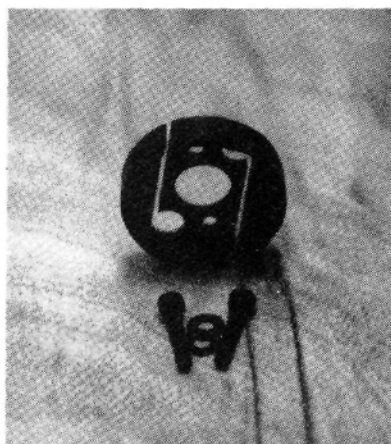
Here's a rear shot of Silas Kwok's beautiful Bell 222 as seen at the '87 AMA National Model Airplane Championships in Lincoln, NB. Author will be the event director at the Nats this year and will report on the contest.

on and from which to receive advice on all sorts of setups and tech tips. Join right away and show your support for this organization. Send inquiries to Don Chapman*.

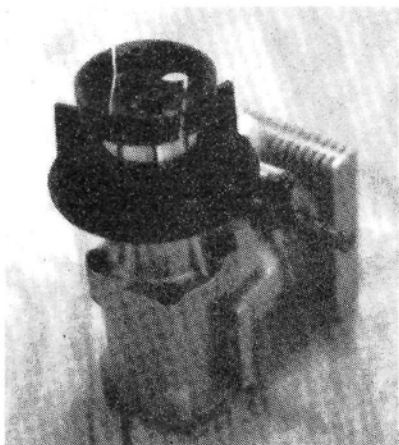
Mixed Maneuvers

For the last few months, I've been working on basic aerobatic maneuvers that can be performed with model helicopters. I've discussed the stall turn, the loop and the roll. If you're comfortable with the mechanics of performing these basic maneuvers, then consider mixing them to produce more complex aerobatics.

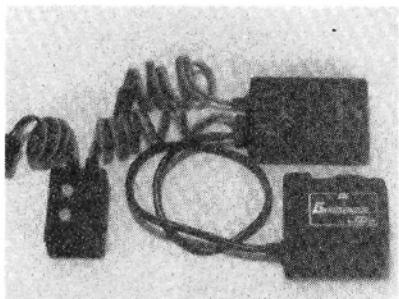
Most aerobatic maneuvers consist of segments of two or more basic maneuvers and, for the most part, a maneuver can be divided into parts like the quarter loop, half roll, quarter loop, etc. Rarely will any part of a complex maneuver



This is the new, one-piece, metal clutch for Kalt helicopters. (See text for more info.)



Another look at the simplicity of the one-piece metal clutch available from Hobby Dynamics. This part should be indestructible.



The new modular gyro from JR will permit some flexible installation options along with some other unique features (details in article).

be flown during the execution of more than one basic maneuver. So, if you can keep this simple thought in mind, you'll find some of this "fancy flying" fairly easy to accomplish.

Let's take a look at four maneuvers:

- **The Immelmann Turn:** This is accomplished by pulling the model up into a half loop. When the helicopter becomes inverted, it's rolled upright (half roll) and exits straight and level. The Immelmann is deceptively simple, because you must make the loop a size that won't bleed off all the forward momentum so that the roll can be executed cleanly. If the loop is too tight, the maneuver will appear rushed, so experiment with your entry speed and the size of the maneuver.

- **The Split-S:** Basically an inverted Immelmann, the procedure for performing the Split-S is to half-roll the helicopter to inverted, and pull through a half loop back to upright. Again, the trick to making this look good is size and speed. If it's too slow, your helicopter will appear to be falling out of the sky; if it's too fast, the maneuver will look rushed. The Split-S looks nice if there's a very short segment of inverted flight before pulling into the loop.

- **The Cuban 8:** This isn't for everyone, and it's definitely a challenge. Start by pulling the model into an inside loop. As it finishes three-quarters of the loop, pause and half-roll to a heading that's diving toward the ground at a 45-degree angle. Next, pull the model back toward upright,

and execute another three-quarter loop; pause, and half-roll until it's again diving toward the ground at a 45-degree angle. Smoothly pull the model back to upright, and exit straight and level. To make the two half rolls intersect at the same spot in the sky, make the two loops the same size and the 45-degree legs the same length. Obviously, you'll need a machine with lots of power to get all the way through the Cuban 8 without stalling.

A slightly easier version of this maneuver is a *reverse Cuban 8*, which is almost the same as the Cuban 8, but you pull up to a 45-degree angle and half-roll, pull through an inside loop into another 45-degree climb and half-roll, and finish by looping back to upright. Some people feel more comfortable doing the maneuver this way, because the half rolls are finished with the nose pointed at the sky instead of at the ground!

- **The Rolling Stall Turn:** Start this turn by flying straight and level at full speed, then pull the nose up to vertical. Once you've established the vertical line, half-roll the helicopter and pause on the vertical line again. As the vertical air speed bleeds off, kick left tail rotor and stall-turn through until the helicopter is pointed straight down. Let the helicopter fall down for the same distance as you climbed vertically, and recover by pulling the nose up to straight and level. Exit at the same altitude as you entered.

The biggest problem with the rolling stall turn is that the helicopter must be really *moving* to get through the vertical half roll and stall turn and then recover before the altitude has dropped below the entry altitude. It helps to leave the power on and hold some forward cyclic as you begin up the line. Reduce the power when you can no longer hold the nose on the vertical line, as you've used all the potential energy that this technique provides. If you're really lucky and get a lot of vertical performance from your machine, try doing the half roll on the way down, too!

These maneuvers will give you some ideas. Try inventing some of your own. Even some of the simplest combinations can have very pleasing effects. Remember that all maneuvers consist of lines, circles and angles. Picture the maneuver that you plan to perform, and try to paint that picture in the sky with your helicopter. As with the basic maneuvers, start practicing any new stunt at sufficient altitude until you're com-

portable with the outcome. One final note: Wind orientation can affect your maneuvers. Loops are generally easier to perform *into* the wind, and rolls are usually easiest when executed *downwind*.

This should give you plenty to work on this month. Next month, we'll look at some hovering aerobatics that involve combining forward flight and hovering. Until then, keep practicing!

New Products

I recently had the pleasure of inspecting a couple of new items. The new gyro No. JRJ120 is the first "modular" gyro from JR*, and it's designed to be used with any radio system. The gyro itself is housed in a small case so that it can be mounted as closely to the helicopter's CG as possible. The remaining electronics are connected in the same area as the other radio gear by a cable running from the gyro. The JRJ120 can be used with the new PCM 10 system that allows gyro sensitivity to be adjusted to a two-switch position and any switch-location value. This feature eliminates the sensitivity-selector electronics, which will simply be left out of the circuit.

Another unique feature of the JRJ120 is the way gyro direction is set. If the gyro needs to be reversed, simply unplug, invert, and re-insert the cable from the gyro to the controller unit. Testing showed this gyro was very quick and responsive, and it should give good solid results when airborne.

The next item will be good news to many fliers who have struggled with the clutch systems on most Kalt helicopters. To eliminate some of the failures caused by broken springs and bolts, K&S* Radio Control Equipment has come out with a new, one-piece, all-metal clutch similar to the ones being used by Miniature Aircraft, Schluter and GMP. There are two sizes: one for the .20- to .30-size machines, and one for the .50- to .60-size machines. The machine work on this clutch is very good; it seems to be made of hardened steel; and its top

is dished out to save weight. Check with your local dealer; the clutches should be in stock now.

Until next time ... Happy hovering!

**Here are the addresses that are pertinent to this article:*

Don Chapman, 6225 Taylorsville Rd., Dayton, OH 45424.
JR Propo and K&S Products,
distributed by Hobby Dynamics,
4105 Filedstone, Champaign, IL
61821.

Simple to build
Simple to fly

-Simply Fun!

Rebel

THE CHALLENGE MADE AFFORDABLE

Today's R/C Helicopters, with autorotation, special engines, hi-tech rotor heads and expensive radios have all but forgotten the entry level modeller. How about the fixed wing flier with the ever popular 40 size engine to spare? GMP believes the time has come to bring the R/C challenge to a wider group. GMP has developed REBEL - a simple, yet durable 40 powered helicopter which can use a standard airplane engine and radio.



SIMPLE DESIGN - EASY TO FLY

Rebel is easy to fly and also a snap to assemble. Besides the Rebel's illustrated instruction manual, GMP will have available a low cost, over the shoulder step-by-step Building Setting up and How to fly video.



HIGH GRADE RUGGED CONSTRUCTION

Rebel has many more ball bearings than other R/C helicopters in its price range. It's tough to wear out or damage. It features black anodized aluminum parts and a very simple new space age plastic rotor head yoke. Rebel's total parts count and spare part prices are the lowest in the industry.

Try the helicopter challenge - **RUN WITH A REBEL!**



Taking R/C Helicopter Flying to New Heights!

GORHAM MODEL PRODUCTS, INC.
23961 Craftsman Rd., Calabasas CA 91302

(818) 992-0195
FAX 8187020117

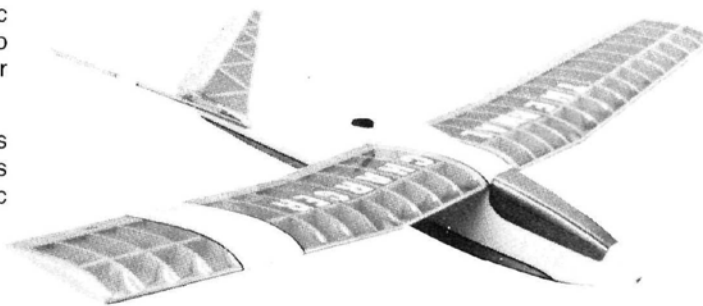
THERMAL CHARGER

If what you are looking for in an electric sailplane is, good looks, easy to build, fun to fly, and great performance, Thermal Charger is the one for you.

Wing Span 60 Inches
Wing Area 545 Sq. Inches
Motor (Included) Leisure .05 Electric



PRECISION PRODUCTS INC. (714) 592-5144
510 E. Arrow Highway, San Dimas, CA 91773



CARDINAL

(Continued from page 70)

side. To complete the radio installation, hook up the wire pushrods to the control surfaces and the servos.

After completing the recommended break-in procedure, the motor is connected to the speed control and then secured in the motor mount with rubber bands. Openings are cut in the front of the cowl for airflow over the motor. Mount the cowl to the fuselage simply by pushing it on. There's a groove around the front of the fuselage, and the cowl has a small lip that snaps into it—a nice touch that makes access to the motor quick and easy. The final step before preparing for the first flight is to mount the prop and spinner.

FINISHING: All you have to do is apply the window and striping graphics

(supplied in the kit). These are the dry-transfer Mylar-type, and if anyone has figured out how to apply them on curved surfaces without getting wrinkles, please let me know. Even with the wrinkles, however, these graphics give the model a nice finished look.

PERFORMANCE: Once everything has been installed, check for the proper CG. My model balanced perfectly with no need for additional lead. The Cessna weighed in at 44.5 ounces, only 1/2 ounce over the highest recommended weight. If you aren't using the Futaba Attack-E with the MCR-4A speed control/receiver, your model will weigh more. This unit has a BEC Auto Cut-Off, which eliminates the need for an airborne radio battery. Even if you use a 250mAh battery, the model will still weigh about 2 to 4 ounces more with the additional weight of a separate receiver and speed control. Kyosho makes

a BEC Auto Cut-Off that I recommend for anyone using any other type of radio. These units are quite reliable, and there will be more than adequate battery power to fly with after the motor has been shut down.

The test flights were carried out at a local glider field that's being converted into a full-blown park. Although the Cessna doesn't have a steerable nose gear, I'm sure that it would have enough control with rudder for ROG takeoffs. However, the field was too rough, and all test flights started from a hand-launch.

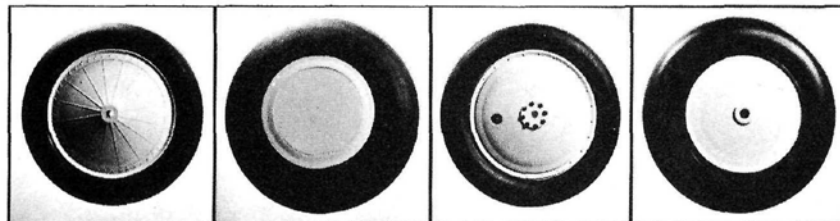
There was almost no wind, so I gave the Cessna 177 a good heave to quickly get it up to flying speed. There was really no need for concern, as the model flew out steadily with a slight nose-up attitude. This model isn't a power-packed demon, but trainers aren't supposed to be. About 1 1/2 minutes into the first flight, I ran into a problem: The motor suddenly quit. With the type of motor and battery used, motor run times should be about 5 to 6 minutes. Initially, I thought that the batteries were at fault, either because of inadequate charging or possibly a bad cell, so I recharged the pack and checked it with a voltmeter. Everything checked out, but I got the same results as those from the first flight. I removed the wing immediately after landing, and found that the MOSFETs on the speed control were quite hot. To prevent damage and to alert you that something is wrong, a heat protector will automatically shut down the unit if there's a heat build-up.

The problem is that there's no air flow through the Cessna's fuselage, and since I was flying at reduced throttle for taking pictures, the MOSFETs heated up. I've since opened up the cowl openings and would recommend that you enlarge the motor hole in the fire wall and make an exit hole in the bottom of the fuselage. Another solution would be to cut an open-

(Continued on page 109)

SCALE WHEELS

RADIO CONTROL • CONTROL-LINE • FREE-FLIGHT



VINTAGE

sizes: 2 1/2"
1 1/2" 3 1/8"
1 7/8" 3 3/4"
4 3/8"
5"
6 5/8"

SMOOTH CONTOUR

3/4" 2 3/4"
1" 3 1/4"
1 1/4" 3 3/4"
1 1/2" 4 1/2"
2 1/4" 5 1/4"

GOLDEN AGE

sizes: 2 1/2"
1 1/2" 3 1/8"
1 7/8" 3 3/4"
4 3/8"
5"
6 1/2"

BALLOON

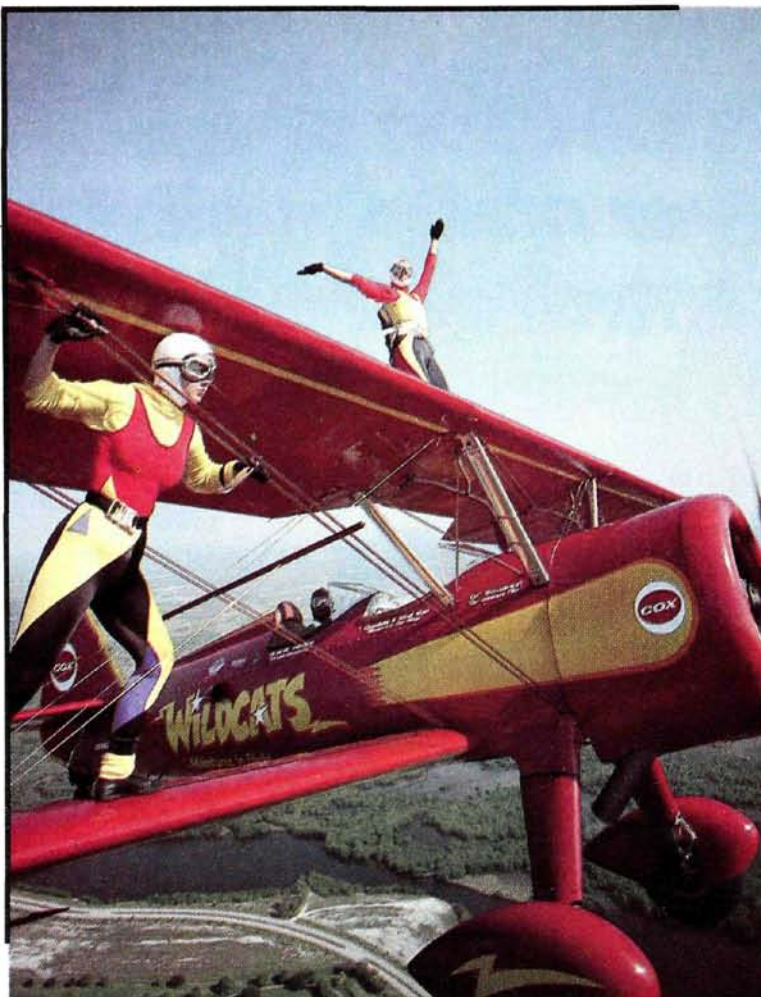
2 1/2" 4 1/2"
3 1/4" 5 1/4"
3 3/4"

SCALE PILOTS • CYLINDERS • ENGINE KITS
MACHINE GUN KITS • PLASTIC DISPLAY MODELS

SEND \$3 FOR COMPLETE COLOR CATALOG

DEPT. MAN • 181 PAWNEE ST., SAN MARCOS, CA. • 92069





by TOM MEEHAN

at the show completely ruined by a bored and restless youngster," explains Everett. "We need to hold the attention of the 3- to 12-year-olds by giving them something to look forward to—the anticipation of something they can relate to." So Sonny took a two-year hiatus from his regular circuit of air-show announcing. He reduced his usual schedule of 30 shows a year to only 10 events and used the time to see what theme parks and festivals were doing. The result of his efforts is a wonderful combination of flying acts and Hollywood-style theatrics known as the "Wildcats," and it might well serve the sport of hobby flying!

In a cross-promotion campaign, Cox Hobbies* of Santa Ana, CA, is a tour sponsor for the Wildcats exhibitions, and the costumed characters are known as the "Cox Hobbies Wildcats Kids." At selected show sites around the country, Cox will present its Flying Circle hands-on demonstration, which allows people of all ages to receive an introduction to model airplane flying. The use of

WILDCATS

Air show

Cox Hobbies uses full-scale biplanes to introduce newcomers to aeromodeling

LET'S SEE NOW...take one 1940 Stearman with a 450hp Pratt & Whitney up front; add two lovely ladies who stand atop and walk about on the wings; stir in 22 years of air-show flying experience packaged in one pilot; and bring the combination to a gentle simmer.

While that's happening, carefully dress four actors in cartoon-type costumes and season them well with 600 hours of studio recording time. Now blend everything together in a nice big blue sky, and...presto!...a delightfully fresh look at the world of air shows. It's a special touch of show biz magic created by Sonny Everett, who has been producing, directing and narrating air shows since 1963—in essence, a recipe for entertainment!

Long ago, Everett saw the need for aerial entertainment events that would appeal to a broader audience—especially the younger age groups. "I've seen parents (usually moms) have an otherwise enjoyable day

new modelers to the hobby is undeniable, so an alternative form of introduction was chosen—control-line flying! Reaction to the operation is

almost 100 percent positive, and the long waiting lines for a turn at the "stick" show the public's enthusiasm for the concept.

The Everett organization is well-known for producing a variety of specialty entertainment operations for air shows, festivals,

theme parks and concerts. Involved in aviation as a pilot and entrepreneur since 1963, Sonny Ever-





Exhausting Problems?

Get

EXHAUST SOLUTIONS

Send for Slimline's FREE '89 Catalog filled with helpful how-to techniques

Slimline
MUFFLERS

Box 3295, Dept. 1, Scottsdale, AZ 85257



Duracraft, Inc.

1007 Orchard Grove Drive
Royal Oak, MI 48067

DuraPlane II—The trainer rugged enough to teach an entire club to fly. Tell your hobby shop owner you want to see the toughest model airplane that money can buy!

WILDCATS

ett gave us the "Air Show America" touring aerial circus during the '75 through '77 American Bicentennial celebration. You've seen him on TV's old "Mike Douglas Show" and in movies like "Cloud Dancer" and "Moving Violations" with David Carradine and Robert Conrad, and you've heard his distinctive narration at nearly every major air event in North America, from Oshkosh to Reno to the Florida State Air Fair. He also co-produced parts of Disney World's fifteenth anniversary celebration and served as an aerial-show consultant to EPCOT Center and Sea World. With that experience, he created Wildcats as a total entertainment package that's certain to go beyond the air-show scene to include video programs and TV specials, the first of which is set for release this summer.

Teaming up with Walt Pierce, one of the best Stearman pilots around, was a matter of good timing and business sense. A full-time show pilot, Pierce arrives in town early for news-reporter flights to hype the event—a very important aspect of air-show promotion. After Walt's airplane had been painted in the Wildcats scheme and colors, two—that's *two!*—lady wing-walkers trained for 90 days in Sebring, FL, last winter.

Meanwhile, at Everett's base in Naples, FL, over 400 hours of studio recording time resulted in very special, all-new, music and voice characterizations that create a "theme park" atmosphere wherever the Wildcats perform. Altogether, the complete team consists of eight touring members and another half-dozen back in the studios.

I saw the response of the non-flying public at an early season performance in Daytona Beach, and it was heart-warming and rather surprising. I had never seen so many kids react with so much enthusiasm to any air-show act. The smiles and looks of excitement showed that Everett is right on target in filling a void as far as air-show entertainment value is concerned, and this is long overdue in sport hobby flying as well.

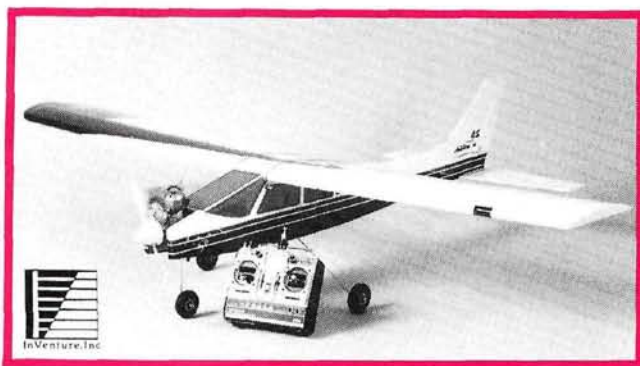
The Wildcats are—pardon me—the cat's meow!

**Here's the address of the company mentioned in this article:*

Cox Hobbies Inc., 1525 East Warner Ave., Santa Ana, CA 92705.

Get on the STICKS... and *Fly RIGHT!!*

PRIMARY FLIGHT TRAINING PROGRAM™



Primary Flight Training Program Video:

- ✓ Teaches basic flight control and safety.
- ✓ Demonstrates training procedures and flight lessons.
- ✓ Explains frequency control and field rules.
- ✓ Utilizes "Ground School" and "In Flight" training.

Text: The Beginner's Guide to Radio Control Sport Flying, Douglas R. Pratt, Tab Books Inc.:

- ✓ Includes information from the Academy of Model Aeronautics.

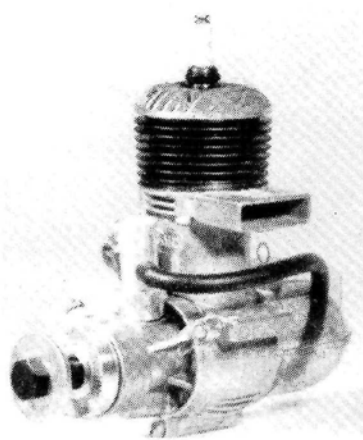
- ✓ STRUCTURE YOUR LEARNING PROCESS FROM PURCHASE TO LANDING.
- ✓ AVOID PREMATURE CRASHES AND UNNECESSARY EXPENSES.
- ✓ LEARN PROPER SAFETY AND CONTROL.
- ✓ MAKE LEARNING TO FLY EASY.
- ✓ VASTLY INCREASE YOUR CHANCES OF SUCCESS.

- ✓ **GREAT FOR CLUB INSTRUCTORS & HOBBY SHOP OWNERS.**

SEND Check or Money Order (\$29.95 + \$2.00 S&H) for Beta ____ or VHS ____ to:
InVenture, Inc.
5601 Domingo Road, N.E.
Albuquerque, NM 87108
Or for Visa/MC Orders call collect 1-505-255-5506

Name _____
Add _____
City _____ St _____
Zip _____

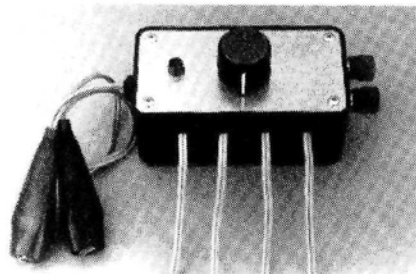
Product News



RJL INDUSTRIES INC. FORSTER .29 - .35 GLOW & IGNITION ENGINES

Last year, RJL purchased all the original Forster tooling and rights, and it's currently finishing a production run of engines that are all being machined on the latest CNC (computer controlled) machines. This will provide the best possible quality at an affordable price: \$98.50 for ignition engines; \$74.95 for glow engines (same price for .29 or .35). Both engines are supplied with the original (not reprinted) box, a parts list and a 1950's brochure. The ignition version is equipped with an original-style, single-speed Forster timer and a clear plastic tank. Both engines are front-rotor-intake versions.

For more information, contact RJL Industries Inc., P.O. Box 5, Sierra Madre, CA 91024.



AMERICAN MANUFACTURING TRICKLE-CHARGER

American Manufacturing now introduces a trickle-charger that's capable of charging as many as four packs simultaneously. The unit has a charge indicator with a four-position selector switch (to determine battery status) and

multi-purpose terminal posts. Its power supply can be any 12V battery charger or AM's exclusive A/C wall module.

For more information, contact American Manufacturing, 1222 E. Eichel Ave., Evansville, IN 47711.



FUTABA 7-CHANNEL FM SYSTEM

With the 7UAF 7-channel FM aircraft system, you have accurate computer control for ATV, dual rate, exponential and mixing. Using data-input keys, all programming settings are made in 1-percent increments and are displayed on an LCD screen. The 7UAF also offers the superior noise-rejection characteristics of FM (Frequency Modulation) operation.

To the really serious flier, the benefits of computer programming are obvious. Flaperon and aileron differential, snap roll (four modes), programmable mixing, and fail-safe and other settings are made, displayed and stored in memory for flawless performances time after time.

In addition to its programming functions, the big LCD screen also provides information about servo-reversing, PCM/PPM switching, transmitter-battery voltage and elapsed time of operation. Everything you need to know for a perfect flight is there, in easy-to-read numbers, at the touch of a button. Even an audible low-battery warning signal is included!

Encasing the electronics is a new transmitter case that's designed for comfort and optimum control. Its contoured back gives you a more stable grip. Mix, rate and auxiliary channel controls are slanted for easier access, and the length of the open gimbal-control sticks is adjustable.

For more information, contact Futaba Corp. of America, 4 Studebaker Dr., Irvine, CA 92718.



PARMA INTERNATIONAL AERO-SPRINT

Parma proudly introduces its first electric R/C almost-ready-to-fly aircraft, the Aero-Sprint, and it brings electric ARFs to a new level. The aircraft comes pre-built (balsa) and covered, and all hardware, a motor, a folding prop, a spinner and wheels are provided. You just have to assemble the major components (the rudder and elevator are even pre-hinged!) and install the radio and 6- or 7-cell "flat" battery pack, which isn't included.

For more information, contact Parma International, 13927 Progress Pkwy., North Royalton, OH 44133.

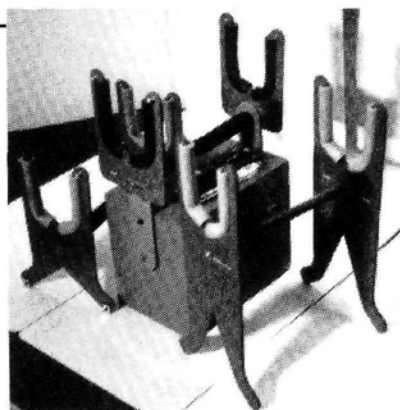


ACE R/C NI-CD VIDEOTAPE

The first in a series of tapes on Ni-Cds, this approximately 1-hour-long videotape gives you a basic course on the nature and nurture of batteries. It tells what they are; how they work; how to charge them at home and at the field; why they're to be cycled and how to do it; and how to care for them when they aren't in use. No R/Cer should lack this basic knowledge.

Narrated by Tom Runge and based on talks with thousands of modelers, this tape addresses all areas of concern and dispels the most common misconceptions. (VHS.)

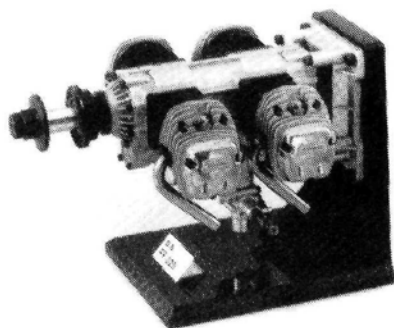
For more information, contact Ace R/C Inc., 116 W. 19 St., P.O. Box 511, Higginsville, MO 64037.



BIG SKY R/C FLOOR-MODEL STAND

Big Sky R/C has just released its latest stand (to go along with its other, already-famous, stands). The Floor Model is adjustable from 3 1/2 inches to 6 1/2 inches, and it's made of 1/4-inch, moisture-resistant, easily painted material that won't separate and is far superior to plywood in every way. The kit includes all hardware and heavy foam for protection.

For more information, contact Big Sky R/C, Lander Indust., 1005-19th St. Ct., Havre, MT 59501.



O.S. FF-320 ENGINE

Giant-scale modelers demand authentic performance and appearance from both their aircraft and their engines. The brand-new O.S. FF-320 engine is perfect for 1/4-scale J-3 Cubs and other scale planes. The flat, 4-cylinder, 4-stroke engine is manufactured to provide unmatched power, reduced vibration and realistic noise levels. For the ultimate in giant-scale realism, the new FF-320 is the perfect engine, and it will surely join the FR5-300 and FF-240 as modeling classics.

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

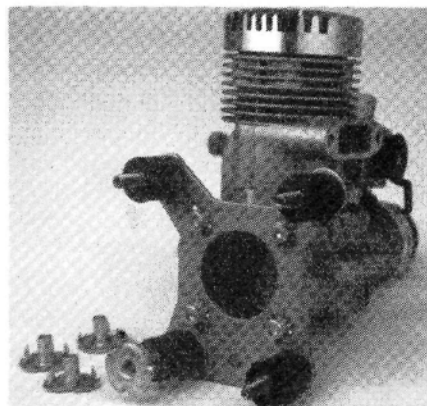


WENDELL HOSTETLER'S PLANS

Wendell Hostetler's Plans announce the release of its latest design, which is a 10th Anniversary Special that includes three plans in one. The plans include a J-3 Piper Cub, a Clipped Wing Cub and a Super Cub, and they're drawn at 30-percent scale with the following specifications: span - 127 inches (102 inches for Clipped Wing); length - 76 inches; wing area - 2,280 square inches (1,824 for Clipped Wing); weight - 22 to 25 pounds; power - 2 to 5hp.

These accessories are available: three cowls (for Super Cub; J-3 and Clipped Wing with dummy cylinders; and J-3 & Clipped Wing without cylinders for use with twin engines like the Saito 270); a special, heat-treated, shock-absorbing landing gear; a high-quality vinyl decal that includes a picture of a 3-inch Cub and the word "PIPER"; 60-inch Edo-type float plans, which may be built in standard form or made to be amphibious, with or without jack-screw retracts; custom kits; and jack-screw retracts. The plans are drawn on two 42x96-inch sheets.

For more information, contact Wendell Hostetler's Plans, 1041 Heatherwood Lane, Orrville, OH 44667.

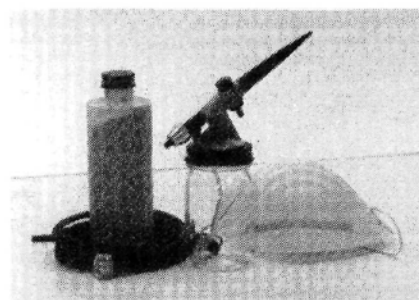


PLANES & THINGS FLEX-MOUNT 40

Planes & Things introduces the Flex-Mount 40, which is a vibration-absorbing

motor-mount system designed to isolate engine-related vibration from the airframe. Benefits of this mounting system include a reduction in airframe-generated noise, an increase in radio-system reliability and an extended structural lifespan. The mount will accept most front-intake .25 to .50 engines. Owing to the universal design of the mount, no drilling or machining is necessary, and all the necessary mounting hardware is included.

For more information, contact Planes & Things, 1226 E. Ave., J-12. Lancaster, CA 93535.



W.R. BROWN INC. HS342 MINI BLASTER

An obvious application for this tool is anywhere that requires the removal of rust, corrosion, or an old finish. When it cleans metal, the surface is microscopically etched, thereby providing an excellent finish that doesn't require additional work before repainting. For "cross kitters" or "kit bashers," paint and decals can be removed from plastics without damaging the integrity of the molded-in detail. The Mini Blaster is also the best means of etching glass and plastics, as it's quicker than hand-etching and less messy than an acid etch. Further, finer degrees of shading can be produced than with acid etching, and it's a more natural method of "weathering" because paint is removed (as would happen on a full-scale plane) rather than added to simulate weathering.

The Mini Blaster Kit comes complete with the Mini-Blaster, a hose, a face mask and 8 ounces of abrasive in 200 grit. Replacement grit is available in 8-ounce jars of 220, 180 and 100 grit.

For more information, contact W.R. Brown Inc., 901 E. 22nd St., No. Chicago, IL 60064.

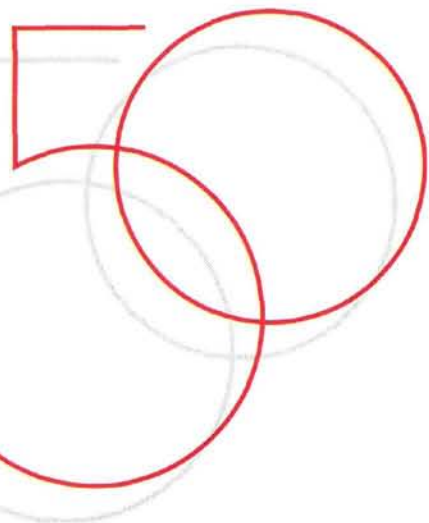


by RALPH CLOUD



F L O R I O

NIFTY



PHOTOS BY RALPH CLOUD & RICH URAVITCH

Ralph Cloud with his review Nifty 50. Colorful scheme makes visibility and orientation less of a problem.

This 3-channel
trainer enjoys windy
weather and thinks it has ailerons

THE FLORIO FLYER* Nifty 50 was designed to be a fun-flying airplane, not a hot, burn-up-the-sky aircraft. Its design is simple: three channels, a high wing, a flat-bottom airfoil and a small engine. You can find these features mentioned on the box of just about every trainer on the market, but nowhere on the Nifty's box does its manufacturer say it's a trainer—they just claim it's a fun airplane, or, to quote the box top, "Surprising performance with 3 channels." During my years of modeling, I've met many pilots who don't acknowledge the enjoyment of flying on three channels. I've owned 3-channel planes that were surprisingly aerobatic; in fact, I had one that surprised many people, because after seeing it fly, they discov-

SPECIFICATIONS

Type: Sport

Span: 50 inches

Weight: Design: 3 to 3³/₄ pounds

Area: 500 square inches

Wing Loading: 15 ounces/square foot at 3¹/₂ pounds

Power Req'd: .15 to .28

No. of Channels Req'd: 3 (rudder, elevator and throttle)

Suggested Retail: \$52.95

Features: Maple engine rails; isolated tank compartment; formed music-wire landing gear; all band-sawn parts; durable construction throughout

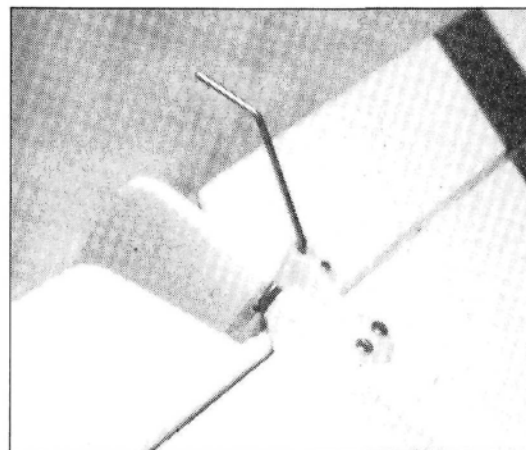
Comments: Has outstanding wood cutting; a broad flight envelope; and well-designed construction.

ered that it had no ailerons. I get tired of hearing "pilots" claim that if it "don't got ailerons, it ain't worth flying."

Mr. Florio doesn't invest a lot of money in advertising, and that's why you probably haven't heard of the Nifty 50. His kits aren't carried by the big mail-order houses, and I looked through several issues of magazines, but could only find a few advertisements from the Florio Flyer Corporation. Mr. Florio, you have a good product; tell the world about it!

THE KIT: On receiving the kit, I was pleasantly surprised to find that all parts had been cut with a band saw and not die-cut. The cutting precision was outstanding; wood quality was excellent, and the spar and leading-edge stock was well selected and evenly balanced.

There were two 24x36-inch sheets of blueprint-type plans; both wing halves were shown full size on one sheet, and the fuselage and tail surfaces were shown on the other. These well-drawn plans have adequate notes and guides written next to the views. The plans contain a list of necessary



Steerable tail skid works well when flying off grass; not very effective off prepared surface. Wheel can be added.

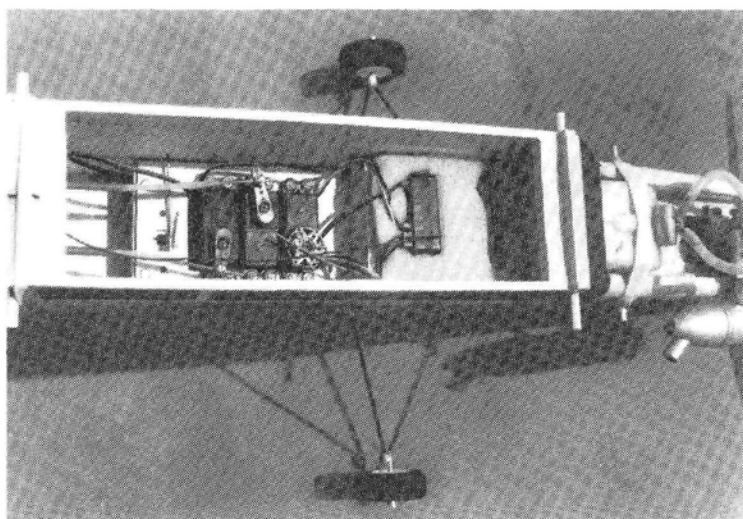
hardware that isn't included in the kit, e.g., wheels, control horn and rods, and hinges.

The assembly instructions were very skimpy and could confuse the modeler of limited building experience. The four-page instructions were brief and had no pictures, but my finished product proves that they were adequate. Several areas should have been discussed in more detail, however, but I'll tell you more about these later.

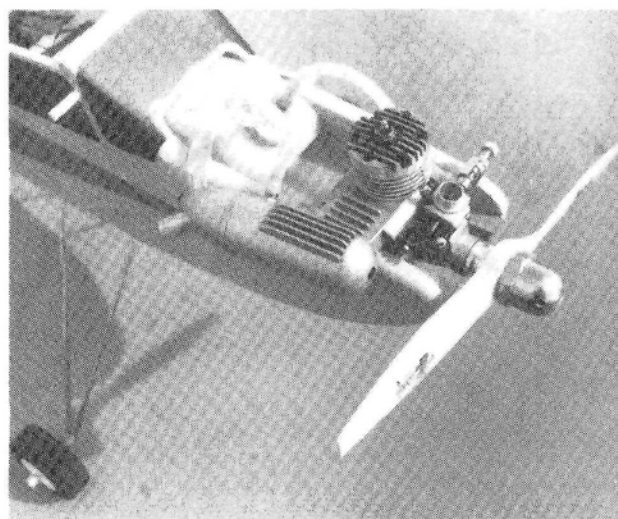
The supplied hardware consisted of the two-piece music-wire landing gear (including wire wrap

for the solder joint), music wire for the tail skid and cloth for the wing's center-section reinforcement. Also included were two strips of aluminum sheet that are used to protect the balsa trailing edges from being crushed by the rubber bands.

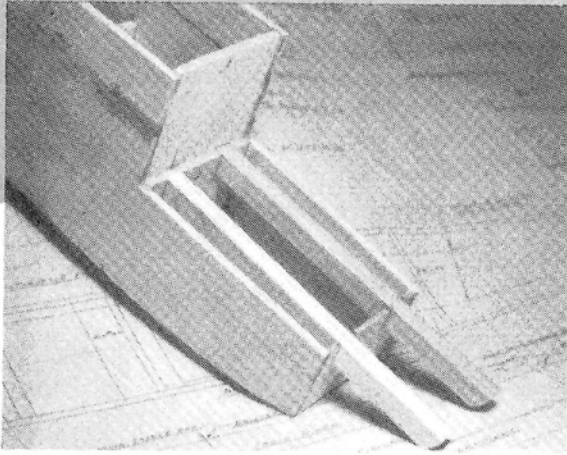
Almost all parts are pre-cut, and I mean *almost* all parts. The only wood that needed cutting was the top and bottom fuselage cross-grain sheeting and the wing center-section sheeting. Everything else was pre-cut: the tip of the wing's top leading-edge sheeting and the top trailing-edge sheeting,



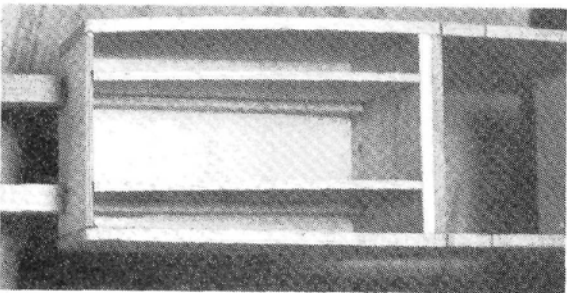
Radio compartment is adequate for any radio with standard-size servos. Receiver is well protected by being surrounded with foam.



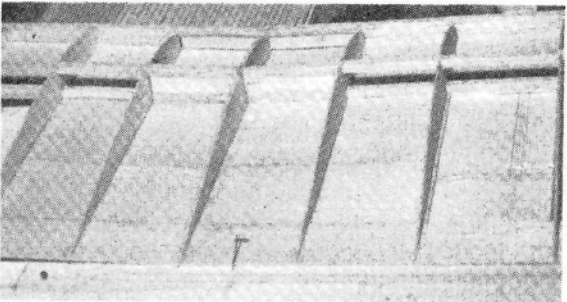
Tank is totally accessible, and this makes getting fuel to the Thunder Tiger engine as easy as possible.



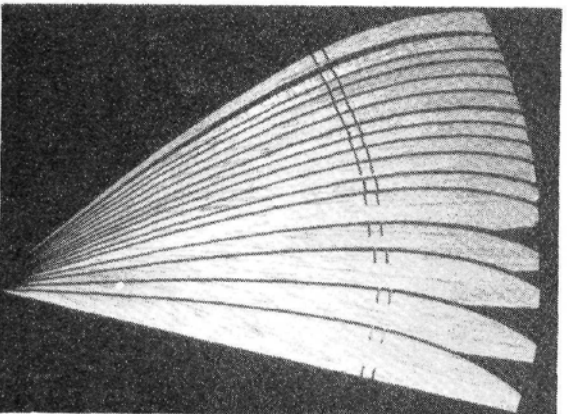
Front end of fuselage is rugged, with engine-mount beams doubling as fuel-tank platform.



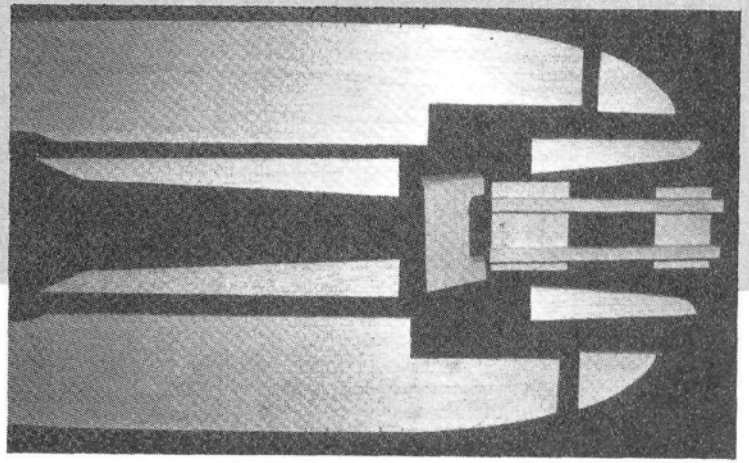
Underside of nose area shows longitudinal stiffeners that add greatly to strength. Probably unnecessary, but thoughtful design feature.



Wing panels are joined at the center section with dihedral braces and spar webbing.



Wing ribs are machine-cut and identical. Spar notches must be final-cut.



Here are the major components that make up the fuselage of the Nifty 50. High-quality parts are noteworthy.

along with the pieces that fit between.

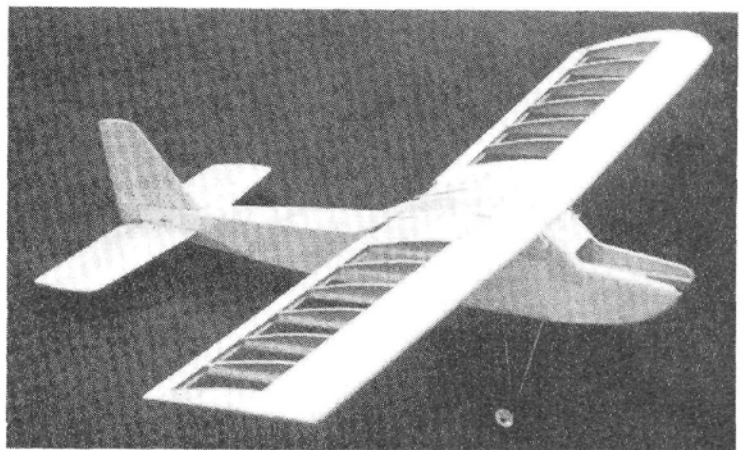
CONSTRUCTION: I epoxied the landing-gear blocks to the bottom of the fuselage, but for all other gluing, I used Zap* and Zap+. Construction began with the wing; its design consists of bottom leading- and trailing-edge sheeting, with the leading edge joined to the front of the sheeting. The two sheets are joined by the bottom cap strips. The cap strips are pre-cut to width and have to be trimmed to fit between the sheets.

The next steps are gluing the bottom spar and the ribs to the bottom sheeting and adding the top spar. The other wing panel is then constructed to the same point of completion. The spars and leading edges of the two halves are then sanded to meet properly with

the dihedral joiner, and a pre-cut balsa main-spar web is used to support the wing spars in the center. The spars are $\frac{1}{4}$ inch square, and the web is also $\frac{1}{4}$ inch thick, making the center a solid fit. A plywood doubler is used to strengthen the leading-edge joint.

The wing halves are joined with one pinned to the building board and the other tip blocked to 3 inches. After joining the two halves, the two-piece center rib is installed. Here I discovered one of the few cutting flaws: The rib didn't allow for the plywood leading-edge doubler and had to be trimmed. The sheeting and cap strips are added to the side that's pinned down. When this is complete, the other side is pinned down and sheeted. My only problem was with the tip sheeting.

(Continued on page 132)



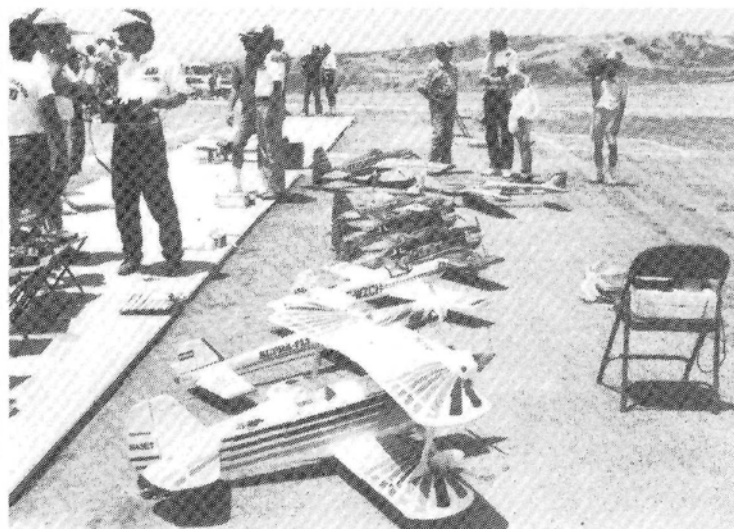
The end is in sight! Uncovered framework lends itself nicely to use of transparent coverings to let structure show through.

Pattern Matters

by MIKE LEE

FOR THOSE OF YOU who don't fly pattern all the time, I'll address precision aerobatics in a little different light this month. Quite a few pilots out there fly aerobatics in a precision manner, but not in pattern competition. Most notably, the scale pilots come to mind. These pilots have the option of flying their ships like the real full-scale ships, and this calls for a high degree of flying accuracy. Depending on the type of ship being flown, precision aerobatics may (and often do) become a part of the flight routine.

Although not performed in quite the same manner as pattern, a scale ship is supposed to duplicate the flying characteristics of the full-scale counterpart. No big deal, you say. Just fly that ol' J-3 Cub in lazy eights and do a low-altitude fly-by. I probably don't have to remind you, but I think one of the toughest sequence of maneuvers in the book to perform correctly is the "terrible trio"—the straight flight out, procedure turn and straight flight back. Looks darn near like an invitation to steal points, but rarely does anyone, including Master Class pilots, ever do it well enough to score three straight 10s.



These scale birds are all capable of performing high-speed aerobatics. Performing aerobatics in scale can be different from pattern.

A scale pilot is able to do his maneuvers as realistically as possible, and at realistic speeds. He could have a real problem, as slowing down a scale bird to perform a slow-speed maneuver may mean hanging that bird on the edge of the flight envelope and risking the big one. A rip-roaring roll by a Mustang is certainly close enough to the real thing, but what about a horizontal eight with something as slow as the J-3? Real Cubs fly less than 100 knots. The takeoff speed of a 1/4-scale Cub would be less than 20 knots, with the flight speed not much faster. So, with this in mind, let's look at scale flight maneuvers.

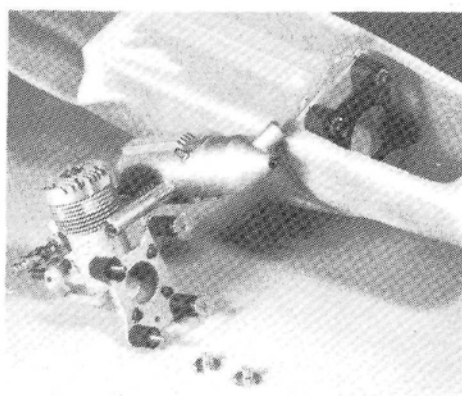
A scale pilot first has to know what the real aircraft was capable of performing. B-17s don't do 4-point rolls, and the scale pilot won't either. But that's an extreme, anyway. Let's take the Mustang driver as our prime example. He has a fast plane, designed as a fighter and capable of flight in almost any attitude. Therefore, it's capable of any precision maneuver that the scale pilot desires to do. His hero is Bob Hoover, who flies the real Mustang at air shows and performs aerobatics, but not in the same style as a pattern pilot.

Our scale pilot would like to do a slow roll, for example. Hoover's Mustang does

a nice slow one, using a gentle arc to accomplish it. Obviously taboo for AMA pattern, but realistic to the max for scale. And that's how the Mustang driver should perform the maneuver—with the arc in it. He'll have to describe the maneuver to the judges, explaining the arc as the real one performs, and that way he garners the maximum points. It doesn't sound hard, but when was the last time you let your airplane arc during the slow roll?

Studying the scale maneuvers is time-consuming and tough. A smart scale pilot will carefully choose the maneuvers that he'll perform and avoid tough maneuvers that the ship resists performing. He must study the way the real aircraft performs, so the method and look of the stunt can be determined. It helps tremendously to practice standard AMA-type pattern maneuvers in preparation for executing a scale stunt maneuver, as this type of practice will provide valuable experience and the feel of the basic stunt. I've noted several top-name scale pilots flying pattern birds to perfect their basic maneuvers. The reason, of course, is the same reason we have for using the ships. Pattern birds are the most honest birds up there, and they let you know when you make a

(Continued on page 108)



The Flex Mount rubber isolation motor mount from Planes and Things is a complete mounting system for .40- and .60-size engines that includes backplate mount, rubber isolators, all hardware and instructions.

PATTERN MATTERS

(Continued from page 107)

mistake...like right now!

This reason is how we got on this subject of pattern and scale. The scale pilots are turning to the pattern birds for help in perfecting the flight maneuvers. They also fly somewhat like scale aircraft, as they have fair wing loadings that don't allow slow-speed flight maneuvering. That's not as bad as a scale bird, but certainly closer than anything else.

As for the maneuvers themselves, scale pilots should take note that realism (in the air) starts with the throttle. Most scale birds have enough power to cope with hard climbs and brisk fly-bys, but real birds don't all fly that way. Starting with the taxi and takeoff, use that throttle to come up on the speed gradually, for that smooth and graceful rotation from the

blow the circles way oversize and miss being anywhere close to the center when the crossover is done. Go too slow and the plane will do small circles and look very marginal in flight. Keep the plane on the wing where you feel very comfortable with the ship. Do easy circles using a minimum of roll angle on the wings, and probably no rudder at all. Keep a constant nose attitude to maintain the altitude for the flight. And, last, use that throttle.

The fly-by is next, and although this sounds easy enough, why not do it right? The book says the length of the maneuver is 5 seconds, with the plane being in front of the judges at 2.5 seconds gone. The altitude requirement is a killer—10 to 20 feet off the deck for this one. I hope you don't have hungry trees lurking about. But that's what the book says, so let's let them have that maneuver.

Begin with the pass being fairly far out from the runway. To prevent any excess maneuvering at the last second, be as straight off the end of the runway as possible. Keep the wings level and use the throttle. Bring the bird down to a realistic speed that's also comfortable for you. Allow the bird to descend to about 20 feet, and then ease the nose to level. Again, check the throttle to ensure a safe and comfortable speed. From here, you merely keep the wings level, the nose level, and set your mental timer to call the maneuver, beginning at three seconds out. By the time you say, "beginning now," the bird will be 2.5 seconds out, easing by the judges for a nice, 5-second

pass. Ease the throttle forward and gently bring her up to normal flight altitude.

Now, this sounds pretty redundant, but every time I watch scale competition, most of the pilots come diving at the deck in a blaze of glory and perform a pass that's more closely related to a strafing run. (And that was for the Cessna 150.) This pass is merely a beauty pass, and not one to prove you have all the nitro in your tank. Take it easy and show them the real aircraft and pilot on board. That is what will impress them and set you up for the real scoring in the optional maneuvers.

Scale aerobatics is a science unto itself, and this discussion is only meant to assist in the basic portions of it. As in pattern flying, smoothness and grace of the maneuvers are of prime importance. Pattern

birds don't have the restrictions of scale flight speeds, and have virtually no slow-speed flight maneuvers, short of a stalled maneuver or takeoff and landing. Therefore, the scale pilots have more to contend with in aerobatics than most of us realize. Whatever you do, if you fly scale, use that throttle to your advantage. Be smooth, consistent and comfortable with the plane. Practice till your batteries drop, and use that throttle.

Parts for Pattern Pilots

Your pattern scouts have found yet another source of pattern birds for the crowds. The newest Japanese design, called the Beetle, is now available in fiberglass and foam formats from Pattern Tek*. This version is available in a pre-fab kit with sheeted wings, graphite reinforced epoxy glass fuselage, sheeted tail feathers and removable stab. Even an optional air brake in the fuselage sides is available.

Mack's Models* has a load of supplies and accessories for pattern pilots. The lineup includes Rossi and Y.S. engines and parts, Hatori stuff, wing covers, MK hardware, and lots of the difficult stuff you need to complete the latest bird. They're nice people—tell them the Kami-kaze sent ya.

I got my muddy hands on one of the slickest rubber motor mounts yet. This one is similar to the design drawings printed right here in "Pattern Matters" sometime back. Planes and Things* has the Flex Mount products for 60- and 40-size birds. The mount consists of a solid plate that attaches to the rear of the engine. Long screws are supplied. Next, three to four (your option) rubber Lords mounts are bolted onto the fire wall, and then matched to the plate mount. Simple, yet really effective. At less than \$18, this is an outstanding value. I have one ready to hit my latest Excelsior design. Try one out soon.

That's about the bulk of flying for now. Hope you're ready for the Nats in Washington State. I blew it for the Masters Tourney, so it's off to the Nats to get my butt kicked over there. My excuse, as always, will be that I was on the pipe and airborne when my plane was hit by a glider...and I lost! See you next time.

**Here are the names of the companies mentioned in this article:*

Pattern Tek, 340-E Turtle Creek Ct., San Jose CA 92125.

Mack's Model, 23 Finchwell Ct., San Jose, CA 95138.

Planes and Things, 1226 E. Ave. J-12, Lancaster 93535. ■



A lineup of scale birds ready for the flight portion of the judging. Flying an accurate precision-aerobatic sequence is a must, and it has to be realistic. This group will see everything from just a flyby to stunt performance.

deck. Climb out shallow and straight, just like the real pilots. Use only as much power as the bird needs to come off the ground nicely. From here, take your time to position the plane for the next pass.

If memory serves me correctly, the next thing to do is the figure eight. Let me tell ya, I put beginning pilots through this pass, and they'll tell you three years later that they won't do that blasted maneuver because it's too hard. This is much harder than it looks. The idea is to get the plane to fly the figure without losing altitude, to keep a concentric circle, and to place the crossover just dead center in front on each pass through it. The throttle is the key to doing this maneuver right. Again, use just enough power to execute the eight with comfort—not too much power, or you'll

CARDINAL

(Continued from page 94)

ing in the fuselage side and mount the MCR-4A so that the MOSFETs hang out in the breeze. Motor run times are now in the range of 4 to 4 1/2 minutes.

The Cessna is a gentle-flying model with no discernible bad habits. It's stable enough for the novice pilot, as long as an experienced pilot is on hand for instruction. Its aerobatic capabilities are limited, because of what it is—a good trainer. I tried to roll the model, but I wasn't very successful; it would make it around, but the maneuver didn't look much like a roll. To execute a decent loop, the plane has to dive and build up speed. What the Cessna *does* do well is fly and land at slow speeds, and this is just what the beginner pilot needs.

The Cessna 177 is a good-looking ARF that flies well and should give you many hours of enjoyable, quiet flight. I would have preferred a more powerful motor, but it can be easily upgraded with one of the LeMans car-racing motors. As with most ARFs, the price might seem high, but it's really a good deal, because you won't have to waste time running around trying to buy bits and pieces to finish it. On a scale of 1 to 10, the Cessna 177 scores a 9+.

*Here are the addresses of the manufacturers mentioned in this article:

Kyosho; distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.
Futaba, 4 Studebaker, Irvine, CA 92718. ■

SMALL STEPS

(Continued from page 67)

(though heavier) model could be built more quickly by using all-sheet tail surfaces, fuselage sides, and so on. Drawing up parts such as bulkheads will present no problem: The FSI plans show all the fuselage cross sections. (Wing ribs and true-length strut layouts are also shown.)

FSI's new scale model plans fill a long-standing need. Earlier designs of this type (e.g., those put out by Golden Age Reproductions and EasyBuilt Models) are mostly deficient in one important quality or another: The models that fly well don't look particularly realistic; those that closely resemble the real aircraft don't fly. SFI seems to have given equal emphasis to both realism and "flyability," and to top things off, they even have a few designs (with more to come) featuring retracting landing gear!

I just have to buy the plans for one of

(Continued on page 110)

THE EDGE

QUICKIE 500 RACER

HOLDER OF
NW AND NATIONAL QUICKIE 500
RECORDS

1.15.60 (2 MILE COURSE)!!

\$79.95

available direct from:

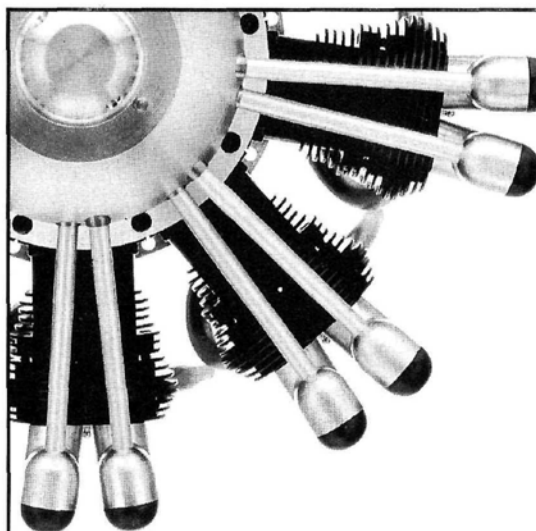
NORTHWEST
Hobby Supply
 Premier Competition Hobby Shop A Division of Hobby Town Inc. From Racing Specialty Outlets

13923 PACIFIC AVENUE
 TACOMA, WASHINGTON 98444
 1-800-541-0645

KIT INCLUDES:

FIBERGLASS FUSELAGE
 FOAM WINGS
 ALL NECESSARY WOOD AND
 HARDWARE, TO INCLUDE
 LANDING GEAR.
 COMPREHENSIVE INSTRUCTION
 MANUAL

Don't Hesitate! Buy a WINNER TODAY!!!



IT'S BIG.

The C Series family of 5, 7 and 9 cylinder fine scale radial engines from Technopower II are **BIG**, in fact 9" in diameter **BIG**. They're also **BIG** on power, precision and scale realism.

Easy to start, powerful and reliable, a Technopower II C Series radial engine will add that certain "magic" to your airplane that only a Technopower II radial engine can.

To find out more about these and other exciting fine scale radial engines, contact Technopower II.

TECHNOPOWER II INC.

610 North Street, Chagrin Falls, OH 44022 • (216) 564-9787
 Complete Brochure \$3.00 • Visa & MC Accepted

Get a 'ROUN' TUIT' Today

30 in. Flying DISC V-STOL
 SUPERIOR Small Field & FUN FLY Aircraft
 STABLE, PREDICTABLE & AGILE

\$43⁹⁵ plus \$4 shipping
 TX Res. add 7% sales tax
VISA • M/C

L. G. not incl.

- Foam & Lite Ply Construction
- ELEVON Mixer Included
- .25 - .40 c.i.d.
- 3 - 3.5 lbs.
- Accurate QUALITY Materials



The ONLY
Money Back GUARANTEE
in the Business

MIN. Const. Time
HOVERABLE
Durable
UNUSUAL
Will NOT Spin

Bonded Model Products
 Box 10998 Suite 543
 Austin, TX 78766
 (512) 250-1420

Another First From McDaniel R/C!

New Solid State On-Board Glow-Plug Drivers

Now you can drive from 1 to 9 glow plugs efficiently and automatically with the new McDaniel On-Board Glow-plug Drivers.

If your engine is a 2 or 4 stroke glow, and has from 1 to 9 cylinders, then an On-Board Glow-Plug Driver will ease the job of starting, and maintaining idle during taxiing and power down flight maneuvers.

Features Include:

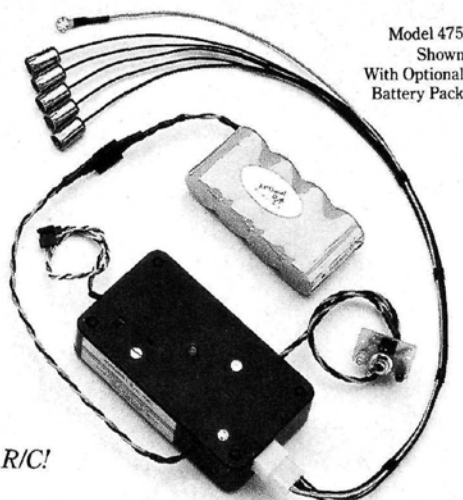
- Servo Reversing
- Optically Coupled Circuitry (No RFI)
- Automatic Shutdown (Via TX Or RX)
- Drive Up To 9 Cylinders With 4.8V 500 mAh Battery*
- Includes Battery Connector & Wire

Another innovation from McDaniel R/C!

*Running Time Increased With Larger Battery

McDaniel R/C Inc.

12206 Guinevere Road, Glenn Dale, MD 20769



Model 475
Shown
With Optional
Battery Pack

Visa and MC accepted.

Phone (301) 464-2260

FAX (301) 262-4433

©1989 McDANIEL R/C INC.

SMALL STEPS

(Continued from page 109)

these and scale-up into an R/C version: Grumman's very first fighter, the FF-1 Fifi. Those tubby little Grumman biplanes were among the most colorful aircraft of all time, and having my own .10-powered R/C version—with working retracts—would be a high point in my modeling career!

FSI plans sell for \$6 each, postpaid. Their owners (Al Arnold, Bill Galloway, George Payne and Curt Upshaw) are open to suggestions for additional models to add to their line. In any case, write to them, enclosing a large SASE, for a copy of their current plans list. You'll be glad you did!

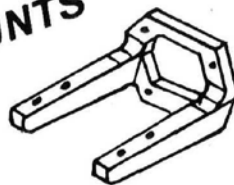
Speaking of retractable landing gear, this is another area where small R/C models excel. Light weight and slow flight make for low landing impact, and retracting gear mechanisms tend to be easily bent by fast, hard touchdowns. I've received a few letters from "Small Steps" readers asking whether any gear-retraction sets for small R/C airplanes are on the market. Not any more, unfortunately, but there used to be. A few years ago, the A-justo-jig Co.* sold a rather cleverly designed sideways-retracting system that was suitable for .15- and .19-powered R/C models. However, as far as I know, it has been off the market for some time. The company *might* still have a few left; you could write to them and ask. (Editor's note: Robart Mfg. has just introduced a new retract unit that's designed for .15 to .40 airplanes. They're mechanically actuated and are only 3/4 inch high.)

Twenty years ago, I designed some simple landing-gear retraction systems for use in a couple of small U-control models. They held up well during many touch-and-go landings, and they could probably be adapted for R/C use. If there's enough interest in this sort of thing among "Small Steps" readers, I could upgrade my old "retgear" designs to make them suitable for R/C use and publish them later in MAN.

I had two different setups: One had straight-back retraction for use in airplanes like the Douglas TBD-1 and Seversky P-35; the other was a sideways in-swinging arrangement for P-47 Thunderbolts, P-51 Mustangs, and planes like that. I never did manage to work up systems for airplanes like Spitfires, Wildcats, or P-40s, though ... maybe some day!

(Continued on page 113)

IT'S MODEL ATONE for precision Aluminum MOTOR MOUNTS



FOUR CYCLE

| Alloy Aluminum Machined Beams | Drilled & Tapped 90 Thrust Line |
|----------------------------------|------------------------------------|
| O.S. | ENYA |
| FS-20 \$7.50 | 35/40-4C \$8.95 |
| FS-40/40S 8.95 | 46-4C 8.95 |
| FS-48 9.95 | 60/80/90/ 120-4C 12.95 |
| FS-60/75/90 12.95 | 120-4C 21.50 |
| FS-61 12.95 | |
| FS-120/120S 19.95 | |
| HP | SAITO |
| VT-21 \$7.50 | FA 40/45 \$8.95 |
| VT-49 8.95 | FA 65 12.95 |
| | FA 120 19.95 |
| WEBRA | Undrilled |
| T4-40 \$8.95 | 60-90 \$11.25 |
| TA-60/80 12.95 | |

TWO CYCLE

| Machined Beams Engine Mounting Bolts Incl. |
|--|
| 1/2 Sh Bm \$3.90 |
| 1/2 Lg Bm 4.10 |
| .09 4.75 |
| .15 Lg Bm 4.95 |
| .19-3.5CC 5.85 |
| .29-40 Lg Bm 6.80 |
| .40-61 Sh Bm 6.50 |
| .40 RV Pylon 7.75 |
| .60 Pattern 10.25 |

GIANT SCALE

| Alloy Aluminum Machined Beams Engine Mounting Screws Incl. |
|---|
| OS Max 90 \$19.25 |
| OS Max 1.08 19.95 |
| Super Tigre-2000, 2500 & 3000 19.95 |
| Zenoah G-38 19.95 |
| Quadra 35/40 21.50 |

C.B. / TATONE, INC.

21658 Cloud Way • Hayward, CA 94545
In CA 415-783-4868 • Out CA 800-482-8663

If not available from your hobby shop, ORDER DIRECT. Check, MO, VISA, MC or COD accepted. Add \$2.50 for S&H, 2.00 for COD. California residents add 6 1/2% sales tax.

We are Europe's leading manufacturer of pilots and supply fully positional figures to many of the National Scale Champs. We dress these pilots in all known apparel. Accessories include: helmets, goggles, sunglasses, bobble hats, baseball caps, floppy hats, bone domes, oxygen masks, maewests. The popular types are WWI, WWII. Sports one piece suit with stripes (all colours). NATO one piece suit with map pockets (olive green). Glider pilots — turtle neck sweaters, floppy hat, and sunglasses. Standard pilots — tan pants, simulated leather jacket with fur collar, baseball hat, and sunglasses. Our pilots are the lightest ever and come to you painted, dressed, and ready to fly.

1/6 scale (2 oz.) \$20.00 1/4 scale (4 oz.) \$28.00
1/5 scale (3 oz.) \$24.00 1/3 scale (9 oz.) \$32.00

Plus \$5.00 postage and packing Airmail.

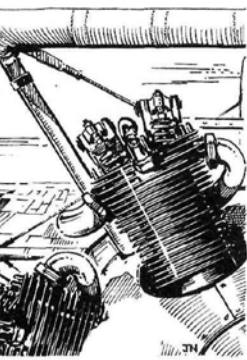
"Have fun with our 1/4 scale parachutist, ram chute, rip stop nylon, ready for the two servos. Takes standard flight pack, all makes." \$90.00 plus \$10.00 postage and packing.

For fast delivery, send or phone your Visa or Mastercharge number.



A.H. DESIGNS

79, Pen-y-Maes Ave.
Rhyl, Clwyd. LL18 4ED
U.K. Tel. 745-353987



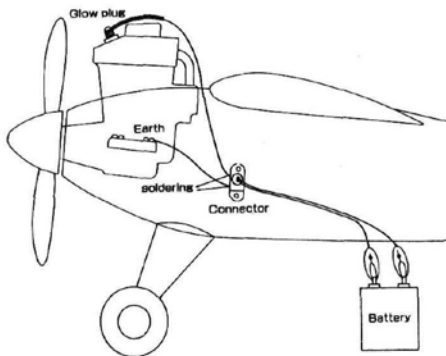
Four-Stroke Forum

by CHRIS ABATE

THIS MONTH, I'll discuss reversing the rotation of 4-strokers. Reverse rotation simply means that instead of the engine turning a propeller clockwise, it will turn it counterclockwise, as viewed from behind the engine.

Why do we want to do this? Well, if you ever want to build and fly a pusher-type aircraft or a multi-engine aircraft, you'll find reverse rotation very valuable. With a pusher-type aircraft, the engine is mounted at the rear of the fuselage or just aft of the wing. A good example of this can be found in the Wright Brothers Wright Flier. In this configuration, the propeller is *pushing* the air rather than pulling it though the blades as in the more common setup where the engine is mounted at the front end of the fuselage or in front of the wing. This is referred to as a "tractor-type" propeller. In addition, if the engine is mounted on the leading edge of the wing and there's more than one engine separated by the fuselage, we'd want the engine(s) on either side of the fuselage to be rotating in the opposite direction to counteract the torque factor.

There's one more reason for having reverse rotation (and this might be the most important of all): There aren't a heck



Typical setup for Enya's safety heater cord.

of a lot of pusher props available in a size and pitch that you might need. By reversing the rotation of the engine and using a standard, or tractor-type, of propeller placed backwards on the engine, you'll get what you need.

Let's take a look at Altech Marketing,* which is the distributor of Enya Engines. Their people told me that they've received so many requests for information on how to reverse the rotation on their line of 4-stroke engines that they've decided to issue instructions, and here they are!

Figure No. 1 shows how to obtain reverse rotation from the Enya .46 4-cycle

and .53 4-cycle engines. As can be seen from Figure 1, to achieve reverse rotation, position the gears by rotating *both* the intake and the exhaust gears 70 degrees (seven cogs) from their regular positions. The intake side rotates clockwise 70 degrees to the left, and the exhaust side rotates 70 degrees to the right, counterclockwise. On the Enya .60, .80, .90 and 1.20 Standard Models, positioning of the timing gears is the same as that shown for the .46 and .53.

Figure No. 1 reverse rotation is as follows:

Enya .60 and .80 4-stroke

Intake rotates 110 degrees (11 cogs) counterclockwise

Exhaust rotates 110 degrees (11 cogs) clockwise

Enya .90 and 1.20 Standard Model 4-stroke

Intake rotates 110 degrees (11 cogs) counterclockwise

Exhaust rotates 110 degrees (11 cogs) clockwise

Enya R1.20 4-stroke

On this engine, the regular revolution is different from that of the others:

Intake side open 30 degrees BTDC; closed 70 degrees ABDC

Exhaust side open 70 degrees BBDC; closed 30 degrees ATDC

Reverse rotation

Intake rotates 110 degrees (11 cogs) counterclockwise

Exhaust rotates 110 degrees (11 cogs) clockwise

It's very important that all these settings are conducted with the piston at top dead center in the compression cycle. Here are the meanings of the abbreviations used:

BTDC: Before top dead center

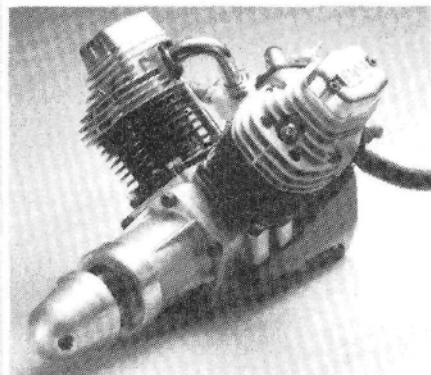
ABDC: After bottom dead center

BBDC: Before bottom dead center

ATDC: After top dead center

TDC: Top dead center, which can be considered as "12 o'clock"

(Continued on page 112)



THE ENYA VT-240 R/C Four-Stroke Twin is rated to handle aircraft weighing up to 22 pounds.

SPECIFICATIONS

Brake Horsepower: 3.2

Max. rpm: 11,000

Rpm Range: 1,800 to 11,000

Bore & Stroke: 1.22x1.03x2 inches
(31x26.4x2mm)

Engine Weight: 60 ounces

Displacement: 2.431 cubic inches
(39.85cc)

Propeller Sizes: 16x10; 20x10

Part Number: JC992

Features: 80-degree, V-twin, 4-stroke glow ignition; overhead valves; steel piston liners; aluminum ringed piston; long-life ball bearings; 2 G-type 7.5mm carburetors and 2 needle valves; optional special muffler set available.

4-STROKE FORUM

(Continued from page 111)

BDC: Bottom dead center, which is "6 o'clock"

Changing the engine from regular to reverse rotation by adjusting the intake and exhaust gears shouldn't lead to any loss of power. If you've reset the timing correctly, the engine will maintain the same power output in either mode.

One other point of interest on the Enya line of 4-strokes is that the glow-plug location is at the *front* of the cylinder instead of at the rear, as on other makes of 4-strokes. Because the glow plug is in front of the cylinder, it's also closer to the prop, so disconnecting the glow driver could be quite dangerous if you put your hand too near the turning prop. Enya is concerned about this, and with each 4-stroke engine, the company includes a safety glow-plug cord set that's designed specifically for Enya glow plugs. The set has connectors that attach to the glow plug and the engine. There's a socket for attaching to the outside of the aircraft, and

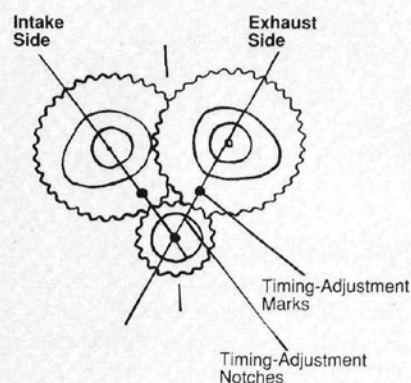
a matched plug with wire leads can be connected to the glow-plug battery or power panel. (A very nice addition!) If you already own an Enya 4-stroker and would like a safety glow-plug cord set, ask for a P/N 2105 Safety Heater Cord, which retails for \$10.25.

If you use Enya engines—2-stroke or 4-stroke—you'll appreciate one of Enya's encyclopedias, which cover the complete line of Enya engines and are filled with illustrations and explanations of each. The illustrations used in this article are taken from this book. Send Altech Marketing \$3, and they'll be happy to send you a copy.

Here's a list of Enya crankshaft diameters and thread-pitch sizes.

| Engine size | Diameter (mm) | X Pitch (coarse) |
|--------------------|---------------|------------------|
| .46 4-stroke | 1/4 | 28 |
| .53 4-stroke | 1/4 | 28 |
| .60 4-stroke | 7 | 1 |
| .80 4-stroke | 7 | 1 |
| .90 4-stroke | 7 | 1 |
| 1.20 4-stroke | 7 | 1 |
| R1.20 4-stroke | 8 | 1 |
| 2.40 twin 4-stroke | 3/8 | 24 |

FOR ENYA .46 4-CYCLE AND ENYA .53 4-CYCLE ENGINES:



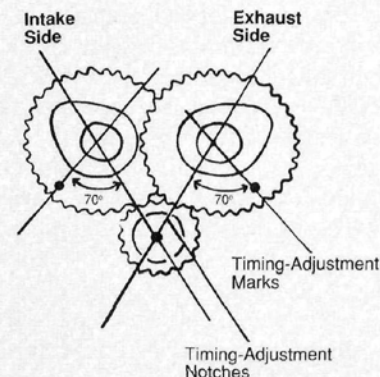
REGULAR REVOLUTION:

TIMING-GEAR POSITION

—at the dead point on the piston

VALVE TIMING

- Intake side valve: open 20 degrees BTDC; close 60 degrees ABDC
- Exhaust side valve: open 60 degrees BBDC; close 20 degrees ATDC



REVERSE REVOLUTION:

TIMING-GEAR POSITION

- Assemble the gears by shifting both the intake gear and the exhaust gear 70 degrees (7 cogs) to the right and left from the regular position. (See text.)

Figure 1

How to achieve reverse rotation: Illustration is only for the Enya .46 and .53 4-stroke. Text describes how to achieve reverse rotation on the other Enya 4-strokes.

I recently attended the Top Gun Invitational in Fort Lauderdale, FL. For full coverage of this event, see the article in this issue by our own Top Gun, *MAN* Editor, Rich Uravitch. I was pleasantly surprised at the number and variety of 4-stroke-equipped aircraft I saw at this major event, and I'll tell you about them in future columns.

Until next time: Keep stroking—forward, or in reverse!

**Here's the address of the company featured in this article:*

Altech Marketing, P.O. Box 391, Edison, NJ 08818.

HOW TO SHEET FOAM IN FOUR EASY STEPS.



1. Pick up a bottle of Southern's Sorghum at your local hobby shop. Sorghum comes in a seven ounce bottle which is enough for a wing and stab.

2. Brush a very thin coat of Sorghum on both the foam core and the sheeting with a foam rubber brush.



3. Allow the sheeting and the foam core to dry completely. This usually takes 30 to 45 minutes.

4. After allowing both surfaces to dry completely, place the sheeting in position and press down firmly. This adheres the two surfaces permanently. That's all!

SOUTHERN'S SORGHUM
The standard by which others have been measured for years.

DAVE BROWN PRODUCTS

4560 Layhigh Rd., Hamilton, Ohio 45013 • Voice (513) 738-1576 • Fax (513) 738-0152

B&C & TOP QUALITY HOBBIES

Brings you an American made, almost ready to fly, high quality balsawood R.C. airplane with rib and spar wings. This glider has a balsa and plywood fuselage with all control surfaces prehung. Rudder horn, push rod and switch-harness is included.

No building! No sanding! No covering is needed! 90% complete right out of the box!

Only the radio, battery and prop is required.

B&C

TOP QUALITY HOBBIES

1001 E. SECOND STREET

DAYTON, OHIO 45402 U.S.A. TEL (513) 228-5525



Introductory Offer
Free 2CH/2SR Radio
With Purchase

FLamingo Glider
Almost ready to fly
Electric Glider

| | |
|-----------|--------------------|
| Wing Span | 60" |
| Wing area | 360" |
| Length | 35" |
| Weight | 30-35oz. |
| Motor | 380 (Not Included) |
| Battery | 6-7 Cell Ni-CD |
| Radio | 2-3 channel |

Sale \$129.99

Offer expires 8/31/89

Postage & Handling \$5.00, for C.O.D. add \$2.75

SMALL STEPS

(Continued from page 110)

*Here are the addresses of the companies you might want to contact:

Flying Scale Inc. (FSI), 1905 Colony Rd., Metairie, LA 70003.

A-justo-jig Co., R.R. 1, Box 673, Noblesville, IN 46060.

Robart Mfg., 310 N. 5th St., St Charles, IL 60174.

MUSTANG 60

(Continued from page 65)

practically floats at low speed. A picture-perfect, three-point landing caps off a perfect flight. After a few more forays, I've reached an unusual decision: I've flown many planes of various types and sizes; but, if properly built, this Mustang is one of the finest I've ever flown. Dynafite is also impressed with this bird, and they've redesigned the .40 size to be the same type of kit, but scaled down. (Maybe they'll scale one up to 1/4 scale.)

This P-51 fun scale is an ideal plane for advanced beginners to experts. It has docile characteristics and can turn a pattern with the best, so I highly recommend this kit.

I call this plane "Ellie's Boy," after my mother, and it's to her memory that I dedicate the plane and this article.

*Here are the addresses of the companies mentioned in this article:

Dynaflite, P.O. Box 1011, San Marcos, CA 92069.

O.S. Engines; distributed by Great Planes Model

Distributors, P.O. Box 4021, Champaign, IL 61820.

Top Flite (MonoKote), 2635 So. Wabash Ave.,

Chicago, IL 60616.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718

A SPECIAL MESSAGE TO RETAILERS

IMAGINE the benefits of drawing many more regular customers into your store every month. Imagine adding a popular, **profitable**—and returnable—hobby product to your store. By stocking **Model Airplane News**, **Radio Control Car Action** and **Radio Control Boat Modeler**, you'll accomplish both! These are the most informative and entertaining modeling magazines available to the R/C consumer—and they're in tremendous demand. These magazines will actually stimulate more sales of R/C Airplanes, Cars, Boats and accessories for you.

If you're not already stocking Air Age magazines, please call us toll-free and we'll let you know how they can make money for you.

Call Kathleen Toll-Free at

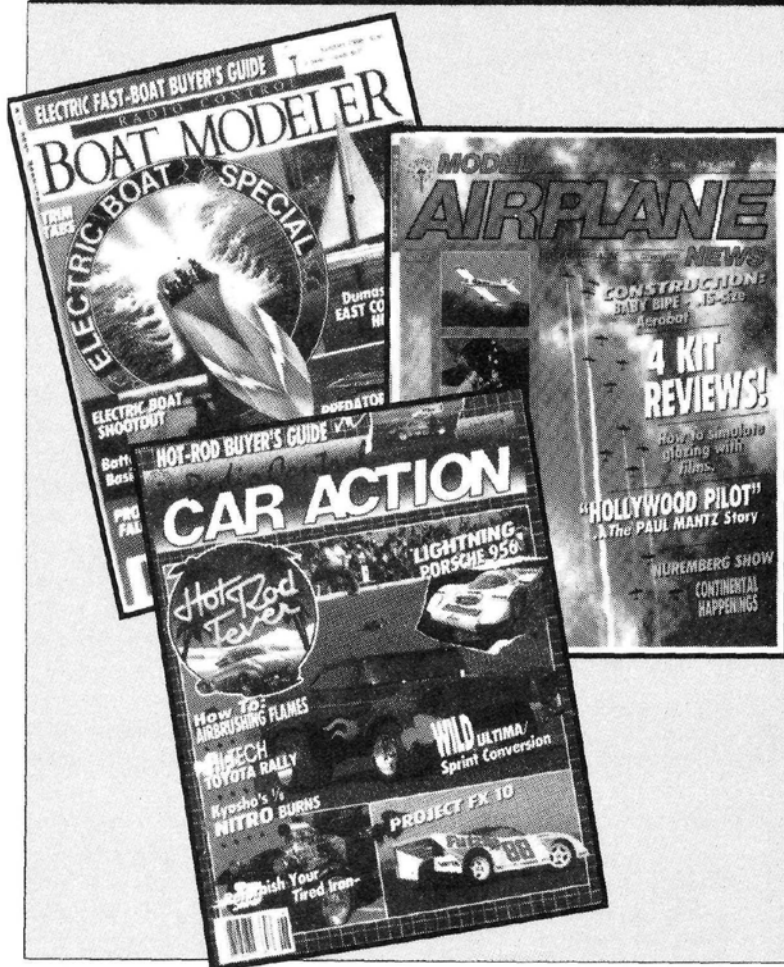
1-800-243-6685

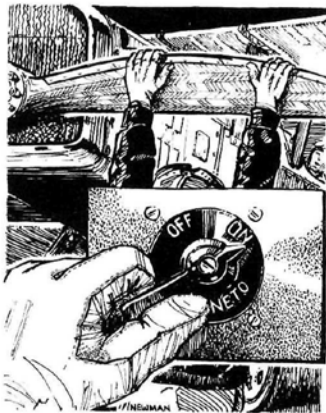
(in CT 203-834-2900)

(dealer inquiries only)

Air Age Publishing • 251 Danbury Road • Wilton, CT 06897

ART0189



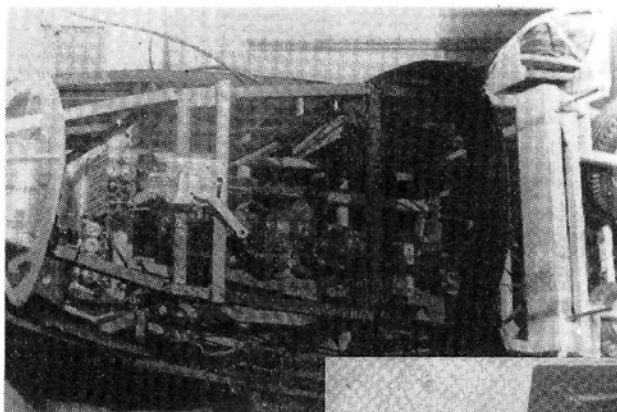


Golden Age of

by HAL "PAPPY" deBOLT

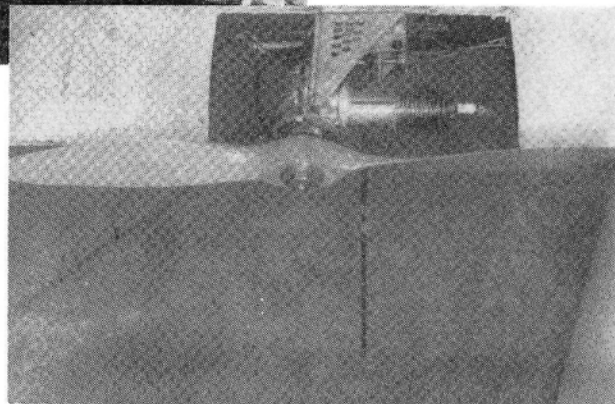
SINCE I'M NOW continuing my report on the Purdue University R/C project, why not review the June '89 "Golden Age of R/C" before you read on? By doing that, you'll have a complete understanding of this most visionary undertaking.

I've already discussed the reasons for the project and the basic R/C equipment that was developed. Remember, its objectives were to demonstrate that flying 1/4-scale R/C versions of proposed full-scale aircraft could help designers to evaluate their aerodynamic qualities. It was the late '30s, and the R/C hobby was in its em-



LEFT: Multi-control system in the XP-1/4. Note the multitude of batteries, tubes, mechanisms and rubber bands! Compare with others of that era, and even today!

BELOW: The XP-1/4 Brown Jr. engine installation (modern appearance?). Note hand-carved prop, ignition system and centrifugal switch; complex?



VINTAGE RADIO CONTROL SOCIETY

Membership Application

With this application, I express my desire to become a charter member of the Vintage Radio Control Society and to support its objectives.

Name _____

Address _____

City _____

State _____ Zip _____

Phone () _____

AMA Number _____

Age _____ Years in R/C _____

Willing to be a society director? Yes _____ No _____

Newsletter? Yes _____ No _____

Please enclose initiation fee of \$15.00 payable to Joe Beshar, 198 Merritt Dr., Oradell, New Jersey 07649.



The Vintage R/C Society is growing quickly. Still time to be a charter member with this application blank.

bryonic stage. No one contemplated R/C scale, let alone 1/4 scale!

Three scale models were involved: Two were created for the project, and one was already in existence. Because this was a university project, it was open to many students and professors.

Evaluating the performance of the R/C versions of possible new aircraft was a major consideration. The use of flight recorders was dismissed, because they would have added too much weight to the models. However, the report suggested that, with sufficient funding, it would be possible to produce miniature aircraft with onboard recording systems. The flying weight of these aircraft was projected to be approximately 800 pounds, which was thought to be about one quarter of the weight of a full-scale craft. Research showed that adaptable engines of sufficient power were available and that the development of suitable radio gear was a distinct possibility. Not too many years later, this became a reality in full-scale aviation.

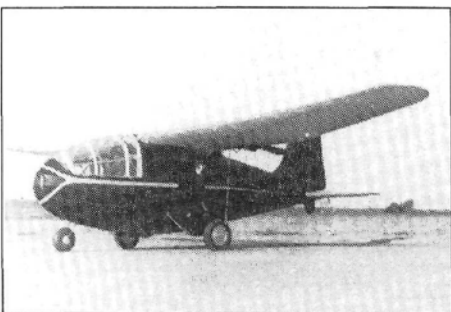
The method of evaluation used had been common in model aviation since its inception: Simply compare the performance of a new design with the known abili-

ties of an existing design. Two models were required, and since the Aeronautical Engineering Department was already working on a new, full-scale civilian aircraft, their design, the Purdue XP-1, was chosen for one model. These engineering students wanted to create a superior four-passenger craft that would be suitable for cross-country flights. Impressive even by today's standards, their full-scale plane was designed for maximum efficiency. In the streamlined fuselage, passengers sat forward of the wing in a transparent enclosure. The two engines that faired cleanly into the wing trailing edge just outboard of the fuselage were a distinct advantage for 1/4 scale. The use of trike gears—a design then in its infancy—provided excellent ground handling. Following the efficiency kick, the trike gear was also fully retractable! As the photos indicate, the result was a mighty pretty airplane! I wonder if a full-scale prototype

was ever built?

Based on their modeling experience and on the model that had already been built, the R/C group chose a 1/4-scale Piper J-3 Cub as its second model. This was a good choice, even by today's standards, as the J-3 Cub was stable and could be repaired quickly.

The third model, a 1/6-scale model of Mr. Mulligan powered by a Brown Jr. engine, had a direct influence on the other two. Built by Purdue graduate student R.O. Wickersham, it provided a good opportunity to evaluate the basic radio system and to gain some flight training, even though it wasn't in the desired 1/4 scale.



The XP-1/4 was giant size, had retractable landing gear, 4-channel full-house R/C system and flew in the late '30s!

Designed by L.G. DeBey, the R/C equipment was a basic single channel using the ARRL radio and a sequential escapement without automatic neutral. Apparently, all the Purdue system's transmitter signals were operated with "push-button" switches—even the most complex! But this method was cumbersome, and a more sophisticated system was needed. With the Mulligan four-position escapement, the first push-release was for right rudder, the second for neutral, the third for left rudder, and the fourth returned to the first neutral. This *sounds* like the original method used by Bill and Walt Good, but the photos show a much more complex mechanism. For the technically minded, these were basic RF carrier systems. When no control was desired, no RF



Purdue XP-1/4 model used two trailing-edge-mounted, pusher Brown Jr. engines. At 15 pounds, it was "stick-and-tissue"-style structure.

was transmitted. The push-button-activated RF transmission and the receiver energized the escapement electromagnet, so releasing the rubber-band-powered pawl. If the signal was held, the pawl would rotate continuously. Quick blips of RF released the pawl, and then it would quickly return to catch the next escapement arm. To achieve a desired control, you had to know the number of blips needed to advance to the associated arm. Complicating this were the two neutrals: You had to remember which one was in use before deciding how many blips were needed! The control reaction of one blip was noted, and if it wasn't what you wanted, then you knew the sequence of

the desired control. This wing-and-a-prayer method was the main reason why the first R/Cs had to be very stable. All you could hope to do was guide them—they had to fly themselves! Later on, the Bonner self-neutralizing escapements simplified

the sequence by employing only one automatic neutral.

Apparently, the Purdue people achieved what they called "flights" with the Mulligan. (By today's standards, they'd be called disasters!) First, they had "tail-dragger blues"—attempts to take off in a crosswind that resulted in ground loops. They noted that the downwind wing would drop in the loop, and from this, they decided that ailerons were needed for control during takeoffs. If only we could have been there, we could have told them that ailerons were of little use on takeoff!

Later on, the Mulligan did get airborne

(Continued on page 137)

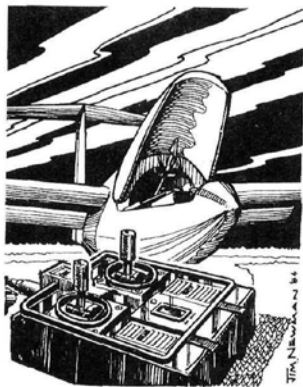


Art May's typical antique R/C taking off at early Plymouth meet. Note dipole antenna with Tx at "V." To the right, pilot with push-button in hand.

ART MAY OF Bismark, ND, commented on the status of the R/C hobby at the time of the Purdue project. The model pictured here would have

been regarded as extremely advanced for that period, and Art tells us it was very successful! The single-channel hard-tube radio was designed by local power company engineers C.L. Bayles and Bill Dribnenki, and it used a four-position escapement, (one neutral, right, left and motor) via an intake "clapper valve."

Art designed and built the model, and all three men enjoyed flying it! The photo shows a demonstration at a local Plymouth meet that drew thousands of spectators. The Plymouth Motor Co., Hearst and Scripps-Howard newspapers, the New York Mirror, the Philadelphia Bulletin and the Navy were among those that helped generate enthusiasm for modeling in those early days. Sure could use some of that today! ■



Quiet Flight

by JOHN LUPPERGER

"RUT"—A FIXED routine of thought or action....

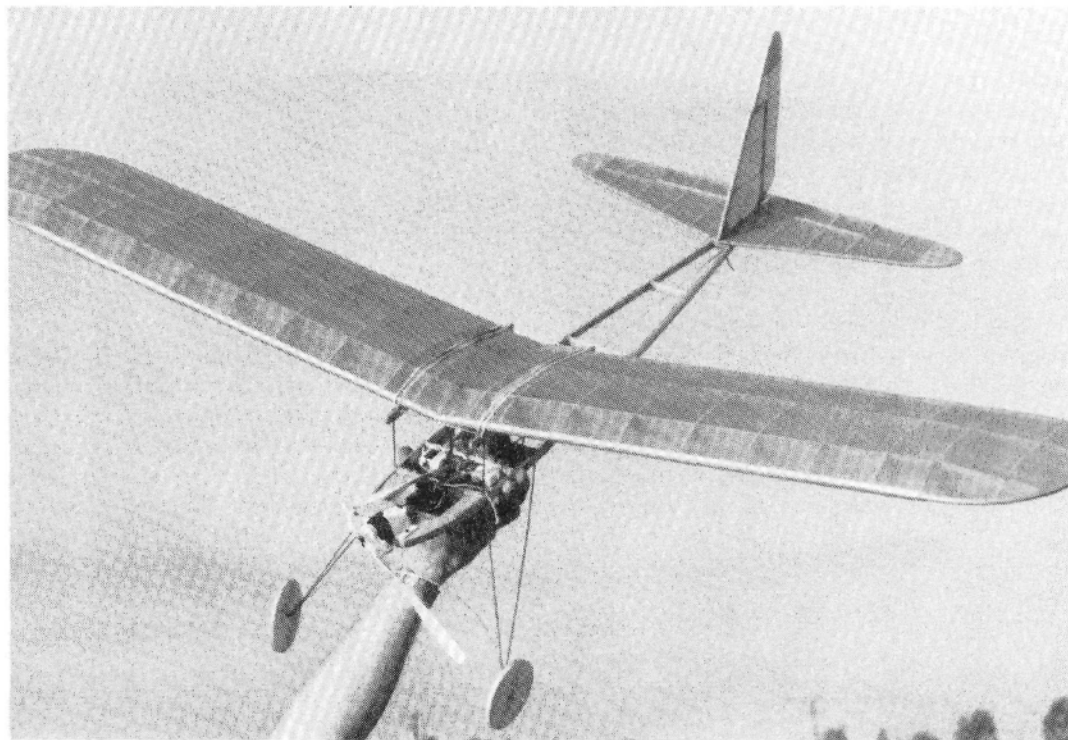
I think the American Heritage Dictionary has a pretty good handle on something we allow ourselves to fall into all too often—a rut! If we enjoy an aspect of our hobby, we tend to overlook other aspects that might have something to offer. I often hear members of one group say that they can't understand how someone could enjoy *that* part of the hobby. Builders don't understand ARF fliers; glider guiders don't understand power fliers; and fliers in general don't understand people who like cars and boats.

Just because it's not your area of interest, don't disregard someone else's interest as having little or no value. Many of the advancements you take for granted were developed by an interest group outside your own. Everyone has something to contribute.

Novak Speed Controls

Novak* is a well-known name with R/C car modelers, but it might not be so familiar to the electric-flight fraternity. Novak makes speed controls, servos, receivers and chargers, and it's generally accepted by most car enthusiasts that when you want the best, Novak is what you want.

Recently, I've been using all of Novak's speed controls: the NES-C-T4, T1 and T1X. The chart shows the specs for each, and I'm sure you'll agree that they're really impressive. I don't own any test equipment, so I'm unable to verify the specs, but I can tell you how they performed for me under actual use. I fly competitive electrics (as well as sport models), and many of my models are



The '36 Flying Aces Stick makes a nice conversion to R/C electric power. Model uses simple lite-ply wheels.

powered with AstroFlight's* 6-turn FAI Cobalt 05. Depending on the prop, this motor can pull as much as 45 to 50 amps static. At these numbers, micro-switches and on/off relays tend to weld shut in the "on" position, and many speed controls tend to blow the brake transistor. During a competition, neither situation is acceptable.

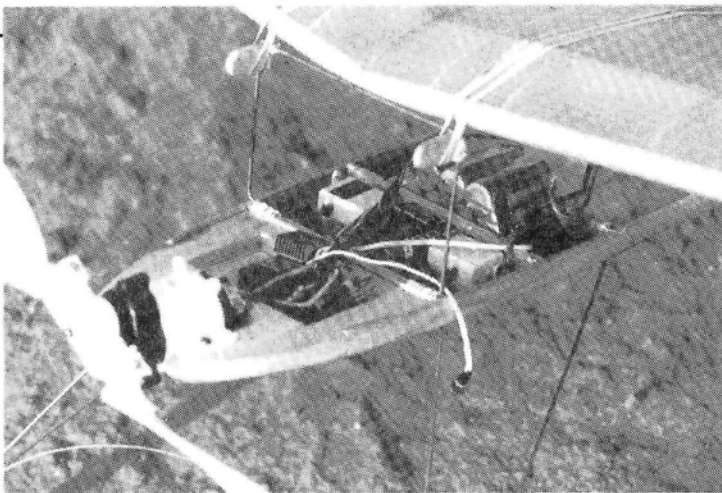
Novak speed controls all use TempFET transistors in the drive and brake circuitry. These transistors shut down and stop functioning if they become overheated. (This will only happen if something is wrong that would otherwise damage the unit.)

I've used the units in a couple of FAI-powered sailplanes and two different sport trainers. When I mounted them in the sailplanes, I didn't use a heat sink on the transistors, although the manufacturer strongly recommends this. In electric sailplane competitions, the motor is run for such a short time that it didn't

seem necessary. Even when I ran the motor for upwards of one minute and after a quick descent, the transistors were cool to the touch. The brake was very effective and stopped the prop immediately, ensuring that the blades folded quickly to reduce the model's overall drag. After many flights, everything is still operating flawlessly.

When used in the sport trainers, I used the heat sink for the drive and brake transistors. In this type of aircraft, the motor is run for a longer time and often at reduced throttle, which causes the transistors to generate more heat. Even under these conditions, the heat sink was only moderately warm immediately after landing.

Another advantage of the Novak speed controls over other car units is that they can all be used on up to 10 cells. Most units are designed to be used on a maximum of seven cells. This is a good example of how electric flight has benefited from another aspect of the R/C hobby. Next month, I'll report on a couple of peak-detector charg-



No reason for speed control or batteries to get hot in the Flying Aces Stick—everything hangs out in the breeze. Original Estes prop wouldn't fly the model and was later switched for a 13x7 Geist folder.

open position: simple, positive and inexpensive. I hope the photo gives you a good idea of how it works (sorry it's not quite in focus!). Give it a

features I look for in an old-timer. And now for the really good news: Randy and the editor of *MAN* have decided to work up a construction article for later this year.

The model is the '36 Flying Aces Stick, which was originally designed by Bill Effinger and Tracy Petrides. Randy's model is built to original size with only minor modifications for R/C and electric

ers I'm trying out: one from Novak and one from Tekin*.

Folding Props

As we all know, a folding prop isn't much good if it doesn't fold! If it continues to freewheel, the disc drag can destroy the model's performance, and you might even have to stall the model to get the prop to fold. This is only a problem if your speed control isn't equipped with a brake, or if the brake itself has stopped functioning. The only thing you can do is replace the unit or send it back to the manufacturer for time-consuming and often costly repairs. Or is there a better, less expensive solution?

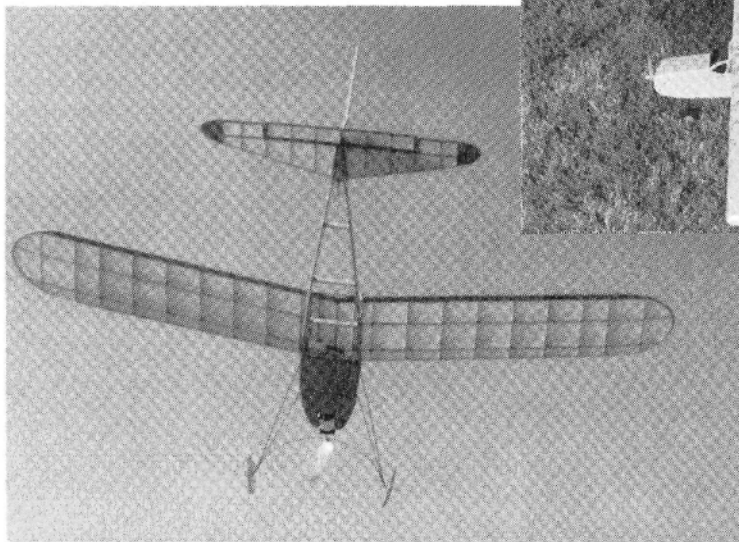
Randy Wrisley of Santa Ana, CA, has come up with a clever answer to this problem: O-rings! If your folder is the type that has a bolt and aircraft nut to hold the blades, all you need are a couple of O-rings or small rubber bands. Just stretch them across the bolt and the base of the blades. Even with a nearly dead battery, the blades will open. And when the motor stops, the blades fold right away!

All you have to do is sand the base of the blades to a rounded contour to prevent the O-rings from holding the prop in an

try. I think you'll be pleased with the results.

Now For Something Completely Different

Have you avoided building an electric old-timer because you didn't want



ABOVE: Three different approaches to come up with a good electric trainer: Kyosho Cessna 177, Midwest Aero-Lectric and Great Planes PT-Electric.

LEFT: Flying Aces Stick in flight. Model looks right, even though it has an open, flat fuselage.

to build a complicated stick fuselage or under-cambered wing, or, worse yet, cover such a structure? Well, Randy Wrisley has discovered an old-timer that's "completely different" from the usual old-timer.

It has a stick fuselage, but we're only talking about two sticks! It has a flat-bottom airfoil that's easy to build and cover and a flat-plate, non-lifting stab—all the

gear. The model spans 60 inches, has 575 square inches of wing area, an aspect ratio of 6.27:1 and a flying weight of 34 ounces, resulting in a wing loading of only 8.6 ounces to the square foot.

The model is powered with a Peak Performance* car racing motor on seven 800mAh batteries. With a 3.8:1 Leisure* gear-reduction unit, it swings a Geist 13x7

(Continued on page 118)

QUIET FLIGHT

(Continued from page 117)

folding prop at 5800 to 6000rpm, and the flying surfaces are covered with Sig* "hot pink" tissue.

I flew the model, and its performance is comparable to other old-timers that are powered with 7-turn cobalt 05 motors. Climb is quite lively and, even though everything is hanging out in the breeze, the glide was very good. I think it will make a great sport model, and it might even turn out to be a good competition old-timer for 7-cell events. Watch for it in a future issue.

Electric Trainers

Speaking of future issues: Be on the lookout for reviews on three different electric trainers. I've recently finished the Kyosho* Cessna 177 Cardinal M36, which appears in this issue and will be followed by the Great Planes* PT-Electric and the Midwest* Aero-Lectric. It was very interesting to see how three different manufacturers approach the task of designing and constructing an electric trainer. All three aircraft are different in design, and all three fly differently. As you can see from the photo, about the only thing they have in common is the high wing configuration and tricycle landing gear.

New Products From Hobby Lobby

Hobby Lobby International* has become the main source in the U.S. for high-performance European gliders and electrics.

Jim Martin has really been bitten by the electric bug and is always scouring Europe for new products. As a matter of fact, Jim has sent so much info on new goodies that I will have to save some of it for next time.

The ASW 22B Elektro, when combined with the new Turbo 700 Direct Drive Electric System, should be a potent thermal soarer. The Turbo 700 is a 9.6V motor and should work well with one of the new Graupner* Scimitar folding props. The wing of the ASW utilizes a modified Eppler 195 airfoil, foam core pre-sheathed with balsa, and pre-cut ailerons. The fuselage has been specially modified to make the installation of the electric gear easy.

By now, everyone has heard of the Graupner UHU. (I did a Field & Bench review in the January '89 issue of *MAN*.) The Chip is the next step in the evolution of this great flying model. It has a slightly smaller (63-inch span) one-piece wing that's equipped with ailerons. It can also be built with a shorter span (59 inches) for speed. The Chip uses the same flight system as the UHU, and it's capable of aerobatics such as loops, rolls and Immelmans.

The Race Rat is a modified version of Werner Dettweiler's '88 World Championship pylon racer. It's such an efficient design that it will even fly fast with the

S.P.E.C.I.F.I.C.A.T.I.O.N.S

The following table lists the specifications for our three different types of TEMPFET® Speed Controls™. All speed controls are available in five different input plug types: Airtronics, Futaba G, Futaba J, KO Propo, or Kyosho.

| | NESC-T4 | NESC-T1 | NESC-T1X |
|----------------------------|----------------------------|----------------------------|----------------------------|
| Voltage Input ¹ | 4-10 cells | 4-10 cells | 4-10 cells |
| Case Size | 1.57"L 1.33"W 0.62"H | 1.57"L 1.33"W 0.62"H | 1.80"L 1.62"W 0.62"H |
| Weight with Plugs | 1.74 oz. | 1.74 oz. | 2.46 oz. |
| Voltage Drop ² | 0.0045 V/A | 0.0030 V/A | 0.0015 V/A |
| Peak Current | 708 A | 1108 A | 2308 A |
| Continuous Current | 176 A | 276 A | 576 A |
| Braking Power | 26 A | 26 A | 52 A |
| Response | 15-20 msec | 15-20 msec | 15-20 msec |
| Current Efficiency | over 99% | over 99% | over 99% |
| Motor & Battery Plugs | yes | yes | no |
| Heat Sink Set | yes | yes | yes |
| LED Indicator | yes | yes | yes |

¹ 4.8-12 V input

² Most important performance specification for a speed control. The lower the voltage drop, the faster is the acceleration and top speed.

Chart showing specs for Novak speed controls.

standard UHU flight system. The kit features a plastic fuselage and a conventional built-up wing. Control is via aileron/elevator/motor control. It has a span of 31 inches, wing area of 271 square inches and an incredibly low weight of 36 ounces. For more information on these models and other new products, contact Hobby Lobby for their new Catalog 14—and tell them you saw it in *MAN*!

As it turned out, I had a lot of electric news to cover this month. I don't want you glider guiders to think I've deserted you, so next month, I'll get back to some coverage of gliders.

Till next time ... good thermals and a full charge.

*Here are the addresses of the companies mentioned in this article:

Novak Electronics, 128-C East Dyer Rd., Santa Ana, CA 92707.

Astroflight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292.

Tekin Electronics, 970 Calle Negocio, San Clemente, CA 92672.

Peak Performance, 150 Los Obreros Lane, Suite G, San Clemente, CA 92672.

Leisure Electronics, 22971 B Triton Way, Laguna Hills, CA 92653.

Sig Manufacturing, 401 South Front St., Montezuma, IA 50171.

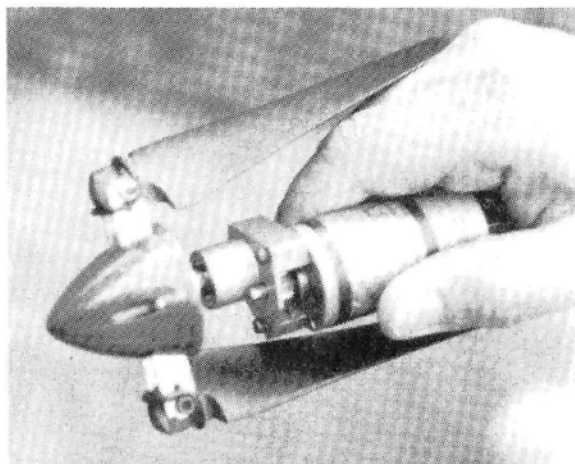
Kyosho; distributed by Great Planes Model Distributors.

Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

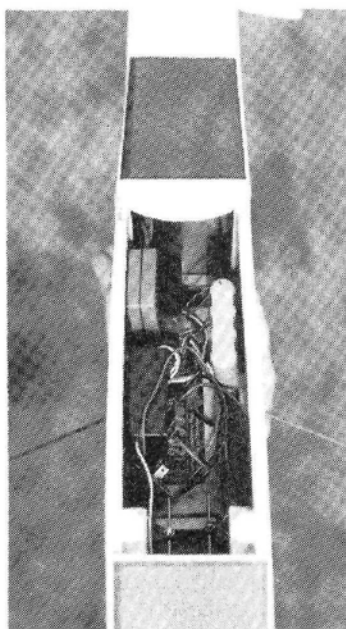
Midwest Industries, P.O. Box 279, Ida Grove, IA 51445.

Hobby Lobby International, 5614 Franklin Pike Circle, P.O. Box 285, Brentwood, TN 37027.

Graupner; distributed by Hobby Lobby International.



ABOVE: Simple O-rings ensure that the prop folds as soon as power is shut down; doesn't impede opening of blades, even at low power settings.



RIGHT: Novak NESC T1 speed control mounted in Midwest Aero-Lectric. Large heat sink keeps unit cool, even when flown at reduced throttle settings.

MIRAGE 550

(Continued from page 73)

gether and gang-sand them to remove any fuzz or slivers that the die-cutting leaves behind. The pre-cut sheeting fit well, and by following the pictures in the manual, the wings went together with little effort. The tips are soft-balsa triangle blocks that are sanded flush with the top of the wing and automatically assume a nice curved outline when the sanding is finished. It's a good-looking wing when completed, but the materials in this particular kit, along with the design, made it a rather heavy one! The rib stock was very hard, as was the sheeting. The finished, sanded wing, without covering, weighed almost 1/2 pound!

The fuselage goes together as easily. The two cabin formers, joined by the servo tray, fit into notches in both fuselage sides. All formers, as well as the top and bottom sheeting, are also notched to fit in just the right places. To assist in aligning the parts for gluing, use the two 1/4-inch-square pushrods on either side of the fuselage when the formers and sheeting are installed. It worked great! I added some uprights and a couple of extra cross braces to a few areas aft of the wing that looked a little open and vulnerable. The elevator pushrod exit at the very aft end of the fuselage should definitely be reinforced with some 1/16x1/4-inch uprights on the inside between the last cutout and the exit. Only a few places needed filling before the final sanding.

The hardwood motor mounts are installed through the fire wall so that the motor fits against their flat sides rather than on the edges (see "How To" in the July '88 MAN). The landing-gear mount is the good old torsion-bar-type that can take a beating and come back for more. The whole fuselage was fun to build and worked out perfectly straight. When complete and ready for covering, the plane weighed 3 1/2 ounces.

The finished airframe was covered with Black Baron* film, and the base color was cream, trimmed with brown, red and yellow, just like the picture on the box. That color combination made a very pretty airplane, indeed! The plastic cowl fit like a glove, and when it was sprayed with Black Baron epoxy, it matched the film perfectly. Although the wheel pants were a little more difficult to assemble, the improvement in appearance was well worth the extra effort, and they can easily be removed when flying from a rough field. I wasn't impressed with the tail

wheel, but it does keep the tail off the ground!

Because the servo tray was part of the basic fuselage structure, radio installation was a cinch. Motor mounting and the associated wiring went just as described in the manual. The motor switch is mounted in the cabin and used as the motor control for 3-channel operation; for 2-channel work, the motor switch is mounted on the side of the fuselage for outside access. Flying weight was exactly 48 ounces, and the balance was just as shown on the plans.

PERFORMANCE: A longer motor run is available with a 6-cell battery pack; for a higher climb and shorter run, use a 7-cell battery pack. Since the 6-cell pack is almost standard for sport flying, it was used for all flight tests.

Because of the non-steering tail wheel, it takes a lot of down elevator during take-off to get the tail flying so that there's some direction control. Don't be in a hurry to lift off, either; let the Mirage build up speed and sort of slide it into the air. It will climb well, but it takes some speed to get it started.

The Mirage is pretty when flying be-

cause it "sits the air well." The climb isn't the skyrocket type, but it's plenty good for sport flying. Loops and rolls are no problem from a shallow dive; touch-and-gos are a pleasure. The motor gets better with use, so a little break-in prior to flying is worthwhile. The average flight lasts about 5 or 6 minutes, but by using the third channel to give the battery a rest now and then, as with touch-and-gos, the total time can be stretched quite a bit. This is a clean airplane with a really good glide, so landings are easy. It's a fun airplane and I like it!

So far, I've concentrated on what I liked about the Mirage. Now for the things I didn't like and some changes I recommend.

The wing builds on the heavy side and an investment in lighter wood for the sheeting and cap strips will pay dividends.

It's absolutely necessary to add some 1/8-inch-square cross braces to the fuselage top and bottom aft of the wing. Put two between the bulkheads, and be sure they're glued to the top sheeting and the sides. Uprights across the open areas of the fuselage sides are an equally good

(Continued on page 126)

1/4 Scale Modelers — Your Search Has Ended! Look No Further for the Perfect Pilot Bust. Completely finished equipped and ready to fly.



Scale : 1/4
Height : 5"
Width : 5 1/2"
Weight: 6 oz.

Price:
\$19.95 ea.
P.&H. \$3.25
per item
Calif. resid.
add sales tax

mga

enterprises p.o. box 5631, fresno, calif. 93755, (209) 224-4170

K&S METAL

- Aluminum/Brass/Copper Tubing & Shapes
- Music Wire
- Tools
- Soldering Irons
- Silk, Silk Span
- Finishing Materials

Send 25¢ for catalog
K&S Engineering
6917 W. 59th Street
Chicago, IL 60638

312/586-8503



FULL LINE METAL SPECIALISTS

HURRICANE



Giant Scale Hawker Hurricane

Wingspan 92 inches
Wing Area 1420 square inches
Overall Length 74.25 inches

Plans, canopy, cowl, belly scoop, and aluminum spinner are available—please write for more information.



Available from:
Roy Vaillancourt
18 Oakdale Ave., Farmingville, NY 11738

NAME THE PLANE CONTEST

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to **Model Airplane News**, Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



CONGRATULATIONS TO GEORGE ROWLEY, of Pacific Beach, CA, for correctly identifying the Edgar Percival E.P.9 general-purpose monoplane shown in our June issue. George's name was drawn from the 16 correct answers submitted. It's interesting that no *incorrect* answers were received, so you apparently either *knew* the correct answer or you *didn't*!

The prototype E.P.9 made its first flight on December 21, 1955, and it traces its lineage to the fertile mind of designer Edgar Percival, who was re-

sponsible for the Gull Series of King's Cup racers.

The E.P.9 was developed to fill the requirement for a single-engine, high-wing, Ag plane. Its laminar-flow wing spanned 43 1/2 feet and had a stressed-skin-metal covering, while the fuselage was a fabric-covered, welded-steel tube. It held a crew of two, as well as four passengers, or 185 cubic feet of cargo. A great short-field performer (while unladen), the E.P.9 had a top speed of 146mph and a landing speed of 37mph—not much more than some of the current ultralights!!



The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.



**BUILD
YOUR OWN
ROCKET
MOTORS!**
WE CAN SHOW YOU HOW!

• **40 POUNDS
THRUST!**
• **50¢ EACH!**

- With a rock tumbler and some simple hand tools, we'll show you how to build **YOUR OWN** rocket engines in your own garage or workshop for 1/5 to 1/10 the cost of the commercially marketed motors.
- **INTERESTED?** Just send us \$2.00 and we'll mail you our brochure along with a **WORKING SAMPLE** of an electric igniter that **YOU CAN MAKE YOURSELF** from materials you'll find around the house.

TELL YOUR FRIENDS ABOUT US! We're the **DO IT YOURSELF ROCKET** people.

Write to: The Teleflite Corporation
Department MN08
11620 Kitching Street
Moreno Valley, CA 92387-9978



Imitari has just introduced an exact 1/2-scale replica of the Pratt & Whitney Wasp Jr. engine with a clock placed in the space normally covered by the propeller cone. The Imitari clock, under authorization from United Technologies, also carries the official registered trademark decal of Pratt & Whitney.

Complete kit: **\$195**, plus shipping
Assembled kit: **\$295**, plus shipping
(available in aluminum or black cylinder)

Available in kit form (more than 200 parts) or fully assembled. Imitari also carries baseball caps, T-shirts, belt buckles, decals in several different sizes, lapel pins, coffee mugs, cigarette lighters, pocket knives and even a .999 full troy ounce silver medallion, all bearing the Pratt & Whitney emblem.

Free Brochure Available

For more information on these and other products, contact

Imitari:
P.O. Box 19688
Las Vegas, NV 89132
702-252-0290

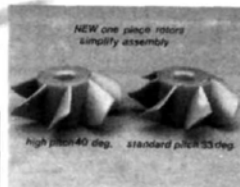
KRESS JETS, INC.

4308 ULSTER LANDING ROAD
SAUGERTIES, NY 12477
(914) 336-8149

DUCTED FANS



Watch for our new RK-709 fan
(27-40oz thrust)
& matching
balsa & foam F-15 KIT!



Write or call for illustrated catalog \$2.50; performance, specs, & prices.

Ducted Fan Balsa Kits



| | |
|--------------------------|----------|
| Nick Zirolli F-4 Phantom | \$129.95 |
| Nick Zirolli F-15 | \$129.95 |
| Aerojet 25 Fan | \$69.95 |
| Aerojet 46 | \$159.95 |

Southeast Model Products

3933 Sport of Kings Rd.
Florissant, MO 63034
(314) 831-4924

VISA & MC Accepted

For more info, please send \$1 and SASE.

Club of the Month



Congratulations to the Billings Flying Mustangs of Billings, Montana. They've been chosen as *Model Airplane News'* Club of the Month for August 1989.

And congratulations to the creative person(s) who thought of the name "Horsefeathers" for the club's newsletter and who came up with a bucking bronc with wings as the club's logo. There's no doubt as to what region of the country the Mustangs are flying over.

The enthusiasm of club President Dennis Sheridan is evident in his column as he tells members about coming events and encourages them to get the whole family out there to watch the fun. When we heard from him, he was anxiously awaiting some decent weather so field improvements could be started.

Informative articles like "The Art of Landing" with its effective illustrations will no doubt make the most critical part of R/C flying much easier for some of the newer members.

Montana is called "big sky country," but apparently those skies weren't quite big enough to keep *three* mid-air collisions from occurring in *one* weekend. (Members refer to it as the "Easter Weekend Massacre.") That big sky produced some pretty nasty crosswinds that contributed to the mishaps. The final showdown took place when one plane was horsing around up there and took the tail right off another. Although some of the planes sustained irreparable damage, the owners were encouraged to try again.

We're pleased to award two one-year subscriptions to the Flying Mustangs to be given to deserving members. These subscriptions might be just the thing to cheer up those who lost their planes over big sky country. ■

Leader in Small Airfoil Technology

MASTER AIRSCREW®

With four series to choose from, Master Airscrew offers a full line of propellers for most any flying application. All are made of tough glass-filled nylon for superior strength and durability.

G/F SERIES



Designed for the sport flyer, the G/F Series is available in 28 popular sizes from 5-11" diameters.

K SERIES



The K Series was designed for 4 and 2 stroke applications. Wide, undercambered blades provide greater thrust for slower turning 4 strokes. In 8 sizes including the new 12 x 8 and 15 x 10; the tips are painted for safety.

ANTIQUE SERIES



Our high performance series features a scimitar shape, swept back tips and plenty of undercamber — these props are suitable for any application. Sizes are 12 x 6, 13 x 6, 14 x 7, 16 x 7 and the new 10 x 5 and 11 x 6. In gold glass-filled nylon.

ELECTRIC SERIES



The 12 x 8 and 15 x 12 folding propellers are for geared systems and the 8" self-feathering, adjustable pitch prop is for 05 direct drive. All give improved thrust and glide with less drag than fixed blade props.

See your Hobby Dealer for MASTER AIRSCREW propellers and accessories

Windsor Propeller Company, 384 Tesconi Court, Santa Rosa, CA 95401

FREE CATALOG!

Completely Aerobatic
Sport Biplane
3 Channel • 42 Inch Span
Fun Free-Style Aerobatics
Forgiving and Stable
American Quality
Superior Performance
Available at Your
Favorite Hobby Shop

For The **FUN** of 96!

Parakeet

.25



Tidewater
Hobby Enterprises
3925-C SE 45th Court
Ocala, FL 32671

(904) 694-3531

Classified

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

SCALE DOCUMENTATION: Plan Enlarging. Photo packs, 3-view drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport. 80-page catalog \$4. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239.

PLANS ENLARGED, Large Scale Specialists. PC Model Software. Free catalog. Concept, P.O. Box 669E, Poway, CA 92064; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

STRIPPED GLOW PLUG THREADS REPAIRED with stainless steel Heli-coils. 2-stroke heads \$7.50. 4-stroke \$10, postpaid. Send head only. Lee Custom Engines, 10112 Woodward Ave., Sunland, CA 91040.

MAKE A BEERCAN BIPLANE, 9 inches with 14-inch wingspan, \$9.95. Kit Three, Box 72104, Marietta, GA 30007.

ENGINES: IGNITION, GLOW, Collectors, runners, used, new. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537.

ALL ALUMINUM P-51D Mustang and P-51B Mustang III Precision 1/4 replica scale R/C kits. Extraordinary museum detail and a thrill to fly! All aluminum chemically milled and cut-out/drilled/formed—ready for assembly. Fifty-three sold to date. Complete kit \$3000. (Less engine & radio.) Sample rib section and details \$25 or SASE for info. Warbirds Aviation, 122 Naubuc Ave., (NAP Bldg.), Glastonbury, CT 06033. (203) 657-3595.

OLD TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*. It contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. \$7.95, add \$1.75 S&H; Foreign Surface Mail, add \$2.75; Foreign Airmail, \$5.50; Payment must be made in U.S. funds drawn on a U.S. bank or by an International Money Order. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

IMPORTED DIESEL ENGINES—WORLD'S BEST SELECTION: Current production Aurora, Cipolla, D-C, Enya, KMD, Mikro, MK-17, MVVS, PAW, Silver Swallow & USE Diesels. Also Mills and Taplin Twin replica diesels and very special imported glow engines. Catalog \$1. CARLSON ENGINE IMPORTS, 814 E. Marconi, Phoenix, AZ 85022.

DISCOURAGED BY TOO-FAST R/C TRAINERS? Ease-of-flying ratings of over 30 popular trainers. \$2. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

NOW, OAK FLIGHT BOXES! Last a lifetime. New designs for easy handling. Extra convenience. Kits or finished. Free radio flyer decal, catalog. Write: S & D Model Products, P.O. Box 4026R, Des Plaines, IL 60016.

ANTIQUE IGNITION AND GLOW PARTS CATALOG: 75 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, Atoms, McCoy's, others. \$8 postpaid. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

EMBROIDERED EMBLEMS, Enamelled Pins, Your Design. Excellent Quality. Free Booklet, A.T. Patch Co., Dept 68, P.O. Box 682, Littleton, NH 03561, (603) 444-3423.

WANTED: RTF U/C planes and U/C race cars, mite cars; complete or pieces, with or without engines. Buy or trade. John Fietze, Box 1521, Amagansett, NY 11930.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, \$4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue.) We do not furnish box numbers. If you would like your ad run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

RAZOR BLADES, single edge, carbon steel, first quality industrial. \$5 per hundred plus 10% shipping. COBBIE'S GIFTS, RR 2, Box 454-A, Staunton, VA 24401, (703) 885-8036.

ALL ALUMINUM P-51D CONVERSION KIT for your 1/4 scale fiberglass model. Convert your existing P-51D model to all-aluminum. Extraordinary museum scale. Use your existing engine and drive line, landing gear, radio and servos. Complete kit \$2500. Warbirds Aviation Conversion Kits, 122 Naubuc Ave., Glastonbury, CT 06033 (203) 657-3595.

WANTED: Japanese twin-engine bombers, plans or kits. John C. Fredriksen, 69 Flamingo Dr., Warwick, RI 02886.

PRIVATE COLLECTION: Hundreds of aviation magazines for sale: *Popular Aviation*, *Flying*, *Model Airplane News*, *Air Trails*, *RAF Flying Review*, *Wings* and many others. 1932-1960. All in excellent condition. Send \$2 for list. William C. Fort, Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

ELECTRIC FLIGHT EQUIPMENT: We cater to the electric flyer. The best and largest electric flight supply in the Northeast. Specializing in ASTRO FLIGHT Equipment. Kits, motors, batteries and lightweight building supplies, plus everything else you need for electric flight. Send \$3 for catalog to CS Flight Systems, 31 Perry St., Middleboro, MA 02346, or call (508) 947-2805 to order. Visa & M/C.

CUSTOM EMBROIDERED PATCHES. Your design made any size, shape, colors. Five patch minimum. Free random sample and brochure. Hein Specialties, 7960 S.W. Manitou Trail, Glen Arbor, MI 49636.

HARDWARE, Socket-Head Cap Screws @ excellent prices. Example: alloy socket-head cap screws 4-40x1/2. \$3.85/100; or Stainless \$5.75/100. For free catalog, write to MICRO FASTENERS, P.O. Box 42, Netcong, NJ 07857, or phone (201) 347-2349.

SCALE R/C PLANS; Giant Plans; Plan Enlarging. Over 200 Vintage Aircraft. Send SASE or \$2 for pictorial catalog to: Paladine Communications, 10721 64th Ave. N., Seminole, FL 34642.

FOR SALE: 1910-1960 model magazines, pulps, juvenile aviation books, historical aviation albums. \$1 list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3

MAGAZINES FOR SALE: *Aeromodeller*, *MAN*, *RCM*, *Flying*, *Air Trails*, *Scale Modeller*, *Wings*, *Air Classics*, and more. Many back to the 1930s. Excellent to mint condition. Send long SASE for list of titles and any inquiries to: Mrs. Carolyn Gierke, 1276 Ransom Road, Lancaster, NY 14086 (716) 681-4840.

R/C WORLD—ORLANDO, FL, CONDO RENTALS— 2 and 3 bedroom-furnished. Available weekly or monthly. Low rates. 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information call Kyra, (800) 243-6685 or write to Air Age Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

FITZPATRICK ENGINES. The new Fitzpatrick 61-ABC is available and in stock. Please order direct. Highest quality engine in the world. Double ball bearing. Muffler included. Lifetime warranty. \$298 plus \$4.95 S&H. Fitzpatrick, 2120 Bentley, #303, West L.A., CA 90025, (phone: (213) 477-2092.

PRECISION COMPUTER-CUT LETTERING for planes, boats, cars; models or full scale. Free information. Write: AeroGraphics, 511 W. Franklin Blvd. Gastonia, NC 28052. (704) 864-2038, 4-10PM (Eastern).

ATTENTION COLLECTORS. Pre-1953 model airplane kits, engines, books & magazines. Write for complete listing. Howard Herrick, 1655 Edgewood Dr., Redding, CA 96003. (916) 223-3714.

WANTED: Complete Hasegawa Museum Plastic Kit, "SE5A," approximately 40" Wing Span. Lawrence R. Mennig, 114 Lauralee Dr., Cahokia, IL 62206.

ESTABLISHED HOBBY SHOP/MAIL ORDER OPERATION. Excellent growth, High volume \$70,000+ net profit! Located in beautiful Colorado. Owner will finance. Call Mark Doran, Business Acquisitions, (303) 758-4600.

MIRAGE 550

(Continued from page 119)

investment.

To add extra life to the pants, epoxy 1/8-inch eyelets through them from the outside where the end of the axle protrudes. They look so good in the air, it's a shame not to fly with them all the time!

The tail wheel is useless and might have been designed that way as a brake! A steerable one would make ground handling much nicer.

This isn't a beginner's first airplane, but if you have some building experience and want a good sport airplane, this one will make you enjoy electric flying.

*Here are the addresses of the manufacturers mentioned in this article:

Carl Goldberg Models Inc., 4734 West Chicago Ave., Chicago, IL 60651.

Black Baron; distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044. ■

GMP LEGEND

(Continued from page 78)

really liked this, because it's much more convenient than going from the instruction book to the exploded-view sheet to accomplish each step.

Because the manufacturer has assembled many of the sub systems for you, the helicopter goes together faster than any other comparable machine. The main rotor head and all the woodwork has been completed for you, and because the belt-driven tail rotor is quite simple, the tail boom and rotor can be completed in less than 30 minutes!

The main rotor blades needed only to have some weight added and a light sanding. The blade roots are pre-installed, too, and that's another time-saver.

An interesting set of tail fins is included in this kit. They're made of Magnalite, which is simply light balsa wood with a pressurized layer of fiberglass on each side. It results in an extremely light, rigid tail surface. The tail fins just needed some priming and light filling before I sprayed them (and the canopy) with polyurethane.

Performance

From the initial test flight, this helicopter really seemed to groove. No tracking adjustments were necessary, and with only a slight adjustment to the tail rotor, the machine became as solid as a rock. While hovering, the lack of a flybar was hardly noticeable.

By the time I'd used several tanks of fuel, I had decided that this helicopter is

(Continued on page 128)



Passe-Temps Cheval de Troie Inc. (Trojan Horse Hobbies, Inc.)

Reasonable prices for Canadian modelers

- If you are looking for radios: Futaba FP-7UAP-PCM-\$909.99, 5UAF-FM-\$519.99, 5UAP-PCM-\$649.99, FP-5FGK AM-\$359.99 (5ch, 4 servos), FP-5UAF-FM (5ch, 4 servos) \$519.99, FP-7UAF-FM (7ch, 4 servos) \$649.99, ATTACK 4NBL (4 ch, 3 servos) \$169.95, FP-2GS (2ch, 2 servos) \$99.95.
- We have all popular planes, cars, trucks, chargers, etc. SuperKote Iron-on Covering — all colors — 6' rolls \$9.95/roll. "Ora-Cote" the newest, best, iron-on in 6' rolls, only \$9.95/roll.
- Enya, Webra, Saito, K&B, O.S. Max engines
- Kits by Goldberg, Graupner, Royal, Dumas, Cox, Kyosho, Tamiya.
- Complete line of LGB and H.O. trains and accessories.
- We will accept mail orders at 514-934-0324 or 2055 St. Mathieu, #401, Montreal, Que. H3H-2J2, if you include your Visa or Mastercard number and signature with your order — no extra charge. We use UPS, CANPAR, and Priority Post. We only ship to address of "cardholder" for your protection. This means we don't charge you for using a credit card. Of course, we will also accept bank drafts, certified checks, postal and bank money orders. Do not send cash by mail.
- Our pricing policy is simple — U.S. list plus 30%. Add 25% to that for mailing or shipping by UPS, balance refunded with order. Remember, U.S. list + 30% = amount in Canadian dollars. No gimmicks, no giveaways — just straightforward prices and follow-up service. Quebec residents add 9% sales tax.
- "We" are the people in Quebec for Omega, Cool Power fuels, and Yellow Aircraft's fine line of products, plus X-Cell choppers.

*We are here to service you! Come visit.
We have the most reasonable prices in town.*

We will even service what we don't sell.

*"We Specialize in Great Things for Nice People."
Watch this space next month for fantastic savings.*



Our store is located in North Montreal
in the Forest Shopping Centre at Amien and Pie-IX Blvd.
(Store 13A: 10561A Pie-IX Blvd., Montreal-Nord, Que. H1H-4A3.

Please call 514-323-7910 (store), 514-934-0324 (admin.), or 514-034-2192 (Fax).

If it's available, we can obtain it for you, or custom orders welcomed.

WE HAVE THE BEST LINES FROM THE BEST MANUFACTURERS AND SUPPLIERS.

| | | | |
|---------------|------------------|----------------|--------------|
| SIG | KYOSHO | FUTABA | ARISTO-CRAFT |
| ROYAL | YELLOW AIRCRAFT | AIRTRONICS | GOLDBERG |
| GREAT PLANES | OMEGA/COOL POWER | AIR AGE BOOKS | TOP FLITE |
| WORLD ENGINES | FOX | KALMBACH BOOKS | ZINGER |
| COX | ENYA | T.S.R. | TESTORS |
| BYRON | O.S. MAX | AVALON HILL | PIC GLUES |
| TAMIYA | SUPER TIGRE | VICTORY | DU-BRO |
| MRC | SAITO | | |

MINIATURE turbo-jet engine

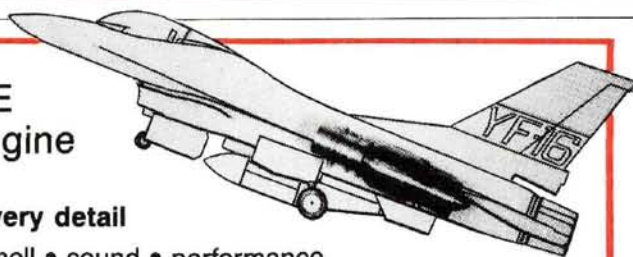
Authentic in every detail

appearance • smell • sound • performance

Brochure and details \$2.00

Turbine
Technologies LTD.

(715) 924-4876
430 PHILLIP STREET
CHETEK, WISCONSIN 54728



GMP LEGEND

(Continued from page 126)

definitely the best "flybarless" rotor machine I've flown. A small amount of cyclic correction must be made when performing pirouettes; other than that, the machine performs static (hovering) maneuvers as well as the version with a flybar (the inverted photographs). I included a flybar on one of my Legends for FAI competition. GMP isn't promoting the flybarless version as an FAI helicopter, but the Legend is a custom helicopter, so it will do it *all*. For all-out fun and, if "dialed in," the best performance (consecutive outside tucks!), the flybarless Legend is the way to go.

As for flying around, the machine feels powerful. The stock Legend is the lightest production helicopter (*actually*, not just box specification) that I'm aware of. This is good, because you can always add weight, but usually, if you reduce the weight of a heavy helicopter, you also reduce strength. Don't be surprised when you find the machine is capable of more than you are! You'll only notice it doesn't have a flybar if you change quickly from hovering to forward flight and vice versa. For first few flights, don't enter and exit forward flight abruptly, because the nose of the machine will pitch (this is related to speed of transition). Remember that as you go *into* forward flight you'll have to hold forward, and as you *exit*, you'll have to hold some back stick.

As far as autorotations are concerned, with extra weight in the blades and a tremendous reduction in drag in the head, no other production machine has more usable inertia at the bottom of an auto. In short, the standard Legend is an excellent fun/sport ship that can be converted into an FAI machine just by adding a flybar.

The Legend customizing technique allows every pilot to have the machine he wants. It doesn't matter if it's FAI, scale, or sport. If you're a beginner or a world-class flier, the GMP Legend won't disappoint you. Virtually no .50- or .60-size machine is easier to build, because much of the complicated and tedious sub-assembly is pre-built and tested for you (e.g., the entire main rotor head and all the woodwork). And as for dependability (a model helicopter's most important feature), even after using 5 gallons of fuel, the machine looks as if I've just finished putting it together, and I *never* have to worry about anything coming off.

Well, keep your nose in the wind, and happy hovering. ■

'LECTRIC HOTS

(Continued from page 24)

for the rear 4/40 bolt. Add scrap 1/8-inch ply above the rear hole for reinforcement.

Block-sand the entire fuselage and hatch, slightly rounding each corner. Blend the nose block into the contours of the fuselage, and round-off its front edges. Cut the air exit in the bottom rear sheeting.

ASSEMBLY AND COVERING: Fabricate a tail-wheel assembly using 1/16-inch wire and a 1/2-inch wheel. A Goldberg* Tailwheel Mount, with the flashing trimmed away, provides a good mount.

Cover the 'Lectric Hots with your favorite iron-on film. The prototype was covered with Coverite's* Black Baron film, which is lighter than most coverings and easy to work with.

Hinge and mount the control surfaces. Radio South* Pro Hinges, cut in half (lengthwise) and secured with thin CA, are simple and light. (Note the 3/32-inch elevator joining wire.) Also, don't forget to mount the tail-wheel assembly before attaching the rudder.

Mount the Halco* landing gear with two wood screws. Use the smallest, most streamlined wheels you can get away with. If you fly off rough grass or just want extra performance, consider leaving off the landing gear. This design hand-launches easily, and it makes nice belly landings with its clean bottom.

MOTOR AND RADIO INSTALLATION: Insert the motor from the rear of B2 and secure it to B1 with the two mounting screws (usually included with the motor). If there's any play around the motor at B2, remove the motor and wrap some masking tape around it to achieve a snug fit.

Apply a coat of thin CA to the battery floor and let it dry. Clean it with alcohol and apply a couple of strips of Velcro to hold the motor battery.

The wing basically serves as the servo mount. The aileron servo is mounted in the bottom, at the center of the wing; the elevator and rudder servos are mounted in the top of the wing on either side of the wing's center rib and to the rear of the aileron servo. Obviously, the smaller the servo, the better. The prototype used a

(Continued on page 131)

AIR JET 222



AVAILABLE NOW!!!
Call for price...

Complete with all mounting hardware.
Will fit KALT, GMP, X-CELL, and TSK.

100% TSK PARKS IN STOCK!!!

Write for free catalog.

Hawaii Precision Products

Suite 204 • 1430 Kona Street • Honolulu, Hawaii 96814

Phone: (808) 949-7849



TOP GUN MEMORABILIA

LIMITED EDITION COLLECTOR'S SERIES

TOP GUN VIDEO

Three days of grueling competition professionally filmed, produced, and edited to music on 1/2-inch VHS video tape. A must for collectors. Running time: 21 min.

\$19.95 A \$39.95
Retail Value!

TOP GUN T-SHIRTS AND GOLF SHIRTS

Multi-colored silk screened T-shirts imprinted on front and back and white golf shirts with Top Gun emblem on breast.

Please specify sizes when ordering.

\$7.95 T-SHIRT **\$16.50** GOLF SHIRT

TOP GUN PROGRAMS

Includes photographs and biographical data on all the Top Gun Pilots. An ideal reference for informed enthusiasts. 16 pages.

\$2.00

TOP GUN STICKERS

Colorful Mylar crack-and-peel stickers featuring official Top Gun emblem. Perfect for flight boxes, books, windows, aircraft, etc. Size 3" x 3"

\$1.50

LIMITED QUANTITIES

AVAILABLE ONLY WHILE SUPPLY LASTS

TOP GUN ORDER FORM

Complete and mail this form with check or money order payable to FTE, or, for faster delivery, charge-by-phone (VISA or MC) at (305) 473-2211. Merchandise cannot be delivered to P.O. boxes.

All prices include shipping and handling.
All merchandise shipped within 24 hours of order.

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

QTY. _____ PRICE _____

____ TOP GUN VIDEO \$19.95 ea. _____

____ TOP GUN T-SHIRT \$7.95 ea. _____

☐ S ☐ M ☐ L ☐ XL _____

____ TOP GUN GOLF SHIRT \$16.50 ea. _____

☐ S ☐ M ☐ L ☐ XL _____

____ TOP GUN PROGRAM \$2.00 ea. _____

____ TOP GUN STICKER \$1.50 ea. _____

FLA. RESIDENTS

ADD 6% SALES TAX

TOTAL \$ _____



FRANK TIANO ENTERPRISES

2460 S.W. 85th Terrace
Davie, FL 33324

'LECTRIC HOTS

(Continued from page 129)

Futaba* Conquest PCM with four S-133 servos, the stock receiver (which is pretty small) and a 225mAh battery.

After cutting the respective servo holes, glue small pieces of 1/8-inch lite-ply to the surface of the wing to act as servo-screw mounts. Install the aileron servo and bend 1/16-inch wire pushrods so that they exit the fuselage via the slots in the wing saddle and attach directly to the horns on each aileron. Insert the elevator and rudder servos, and make up 1/4-inch balsa pushrods to connect them with their respective control horns. These pushrods will occasionally be disconnected from the servo arms (to remove the wing), so use connectors that are easily removed.

Attach the motor on/off switch directly to the throttle servo, either with a ply mount, or with double-sided tape. Mount this assembly to the top of the wing (above the aileron servo) with Velcro. If you're considering a speed controller or an electronic on/off switch, consider this: They both work well, but they cost you a few hundred rpm because of their internal resistance, and you'll want all the power you can get. And if you're like 95 percent of the *real* Hots fliers, you'll be at full power during the entire flight, anyway, and will just pull back the power when you're ready to land!

WEIGHT AND BALANCE: Ready to fly, the prototype 'Lectric Hots weighs between 2.5 and 2.75 pounds, depending on which motor battery is used. This results in a comfortable wing loading of between 17 and 21 ounces per square foot.

Chances are, your 'Lectric Hots will come out a bit nose-heavy, as mine did, so adjust the radio battery rearward on its Velcro mount to correct this. Surprisingly, it seems to snap and spin more crisply at the forward CG point. Check the side-to-side balance, which should be pretty close, since there's no cylinder head or muffler sticking out.

PERFORMANCE: To save time and weight, the prototype originally had just a plastic tail skid. I realized that was a mistake an instant after giving the Hots power on its first takeoff run! The plane zig-zagged across the center line until it eventually picked up speed and got its tail up. With the steerable tail wheel, it will now track right down the center line, with just a few minor rudder corrections.

Much to my relief, that fully symmetrical wing provides plenty of lift, and with no wind, the 'Lectric Hots lifts off within 75 feet on a paved runway. The plane

climbs briskly with the Astro Cobalt up front, and from there on, you'll forget it's electric, as it flies just like its big brother, the Hots. Inverted flight and outside maneuvers are a breeze, and the snaps and spins are very crisp and predictable. The aileron throws indicated on the plans will give a moderate roll rate, approximately like that of a pattern plane. Like most of the Hots fliers I've seen, I've increased my throws a bit to get about 1 1/2 rolls per second.

Wind penetration is very good, but don't forget the rudder in a crosswind! So far, the only damage I've done to the prototype was during a landing with a direct 10-knot crosswind. The plane flared beautifully into a 3-point attitude, but I failed to correct with rudder, and it touched down in a crab to the right of about 20 degrees. The left wheel bent under slightly, and the landing gear popped right off, taking a chunk of balsa with it! A little Super Jet, and a brush-up on my crosswind landing technique, and it's been flying great every since.

The 'Lectric Hots is intended for the proficient flier: either one who's already into electrics and wants something "hotter," or one who's tired of the unreliability, mess and, of course, *noise* of glow engines, but doesn't want to give up performance.

*Here are the addresses of the companies mentioned in this article:

Astro Flight Inc., 13311 Beach Ave., Marina del Rey, CA 90292.

Sanyo 'Lectric, Battery Division, 200 Riser Rd., Little Ferry, NJ 07643.

SR Batteries Inc., P.O. Box 287, Bellport, NY 11713.

Bob Violett Models, 1373 Citrus Rd., Winter Spring, FL 32708.

Carl Goldberg Models Inc., 4734 West Chicago Ave., Chicago, IL 60651.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

Radio South, 9003 North Davis, Pensacola, FL 32514.

Hallco, distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

Futaba Corporation of America, 4 Studebaker, Irvine, CA 92718. ■

WEBRA 50

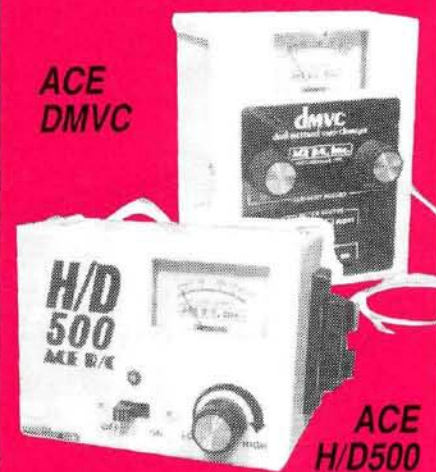
(Continued from page 83)

the heli-engine carburetor sees a higher velocity passing through it (at any part throttle setting) when compared with the fixed-wing aircraft with its variable-rpm engine. All of this means that the standard model engine carburetor might not be expected to perform as well.

I'll just say that the Webra TN carburetor proved its ability to retain correct fuel settings as the throttle was closed incrementally to each of the three smaller

(Continued on page 132)

2 GREAT CHARGERS NOW AVAILABLE IN AC/DC VERSION!



Now you not only get the versatility of these two variable rate chargers, but you also get the added capability of DC operation!

The AC/DC version will allow you to operate either charger from any 12V DC source, such as your vehicle battery. If you already have an H/D500 or DMVC charger, **DON'T FRET!** Also available is the AC/DC Retrofit Kit: complete with switch, components, cigarette lighter cord, and instructions.

| | | |
|--------|-----------------------|---------|
| 34K61 | AC/DC H/D500 Retrofit | \$ 8.50 |
| 34K61C | AC/DC H/D500 Asbld. | 52.95 |
| 34K31 | AC/DC DMVC Retrofit | 8.50 |
| 34K31C | AC/DC DMVC Asbld. | 64.95 |

SEE YOUR DEALER FIRST! If ordered direct add \$3.00 P&H. Complete catalog send \$2.00



ACE R/C

116 W. 18th St., P.O. Box 51107, Hixsonville MO 64037
(816) 584-7121 Fax (816) 584-7766

THIS MONTH'S BEST SELLERS FROM ROBBE.

Knowledgeable dealers nationwide
are recommending Robbe and
Schlüter's hottest kits.

See your Authorized Robbe or
Schlüter Service Center today.

For immediate kit and '89 catalog
orders call Robbe direct at 201-359-2115



WET BIKE Ord. No. 1070

The season's fastest mover moves just like the real craft. Self righting, very stable, and deceptively quick. Kit includes: all molded bike components including the driver, shock absorbers, electric motor, gear set, stern tubes, shafts, counter rotating props., servo saver and hardware. Length: 23 1/4 in. Height: 17 1/4 in.



HAWK

Ord. No. 3159

A glider designed for pilots who want hours of silent soaring. Easy to build and extremely docile with excellent glide angle. Kit includes: Plura fuselage, prefabricated wing components, die-cut and sanded tailplane, decals and all necessary hardware. Wingspan: 110 in. Length: 51 1/2 in.



MAGIC Ord. No. 2880

The most successful helicopter line worldwide just got better. Dieter Schlüter's latest design is a .60 size high performance, aerobatic machine capable of the most difficult FAI maneuvers and then some. A joy to build and fly, Schlüter's Magic will impress your most demanding helicopter enthusiast.

robbe
180 Township Line Road
Belle Mead, NJ 08502

WEBRA 50

(Continued from page 131)

throttle openings; and thus it was a practical, usable device. Similar tests were applied to the YS 60 heli and S. T. S61 heli, and they, too, exhibited good linear settings.

Idling speed on a 10x6 MK "fixed-wing" propeller and Schlüter silencer was 2,200rpm.

Summary

The Webra Speed 50 is clearly at the high-rpm/high-performing end of the range of currently available heli engines. It's a fine example of reliable, though lightweight, machinery, and judging from its condition at the end of the tests, it seems capable of extended life at high rpm. The wide-spaced torque curve indicates, however, the possibility of effective operation at lower rpm if it's harnessed to longer tuned pipes, and it could thus give quieter, but stronger, performance in the 12,000rpm area.

*Here's the address of the Webra 50's U.S. distributor:
Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

QUICKSILVER

(Continued from page 85)

trimmed-out X-Cell, none of the adjustments has been changed. The weight that's been added by the fuselage hasn't affected the performance of an already light helicopter. The difference lies in how much larger and easier it is to see the helicopter when it's airborne. With a brightly painted fuselage, the QuickSilver really stands out in flight, and this makes visual orientation so much easier. With any pod-and-boom helicopter, there are times when it's almost impossible to tell its orientation, but this problem is almost eliminated by adding the QuickSilver fuselage. So when you're fairly proficient in forward flight, the improvement in orientation itself would probably be the overriding factor to consider when adding the fuselage.

I also think (considering the aerodynamics) that the fuselage should improve the flight characteristics of the X-Cell, but that's been hard to tell. If anything, forward flight speed has increased owing to the smooth aerodynamic shape, and autos have a tendency to float a little because of the flat bottom of the front fuselage

section. Walt recommended increasing the size of the vertical and horizontal fins by 50 percent for better tracking and forward flight stability, but I've used the original fins with no problems at all. The QuickSilver could possibly improve the handling characteristics of your X-Cell from an aerodynamic and orientation point of view, but that's asking a lot from a helicopter that, in its stock form, has had a string of contest and fun-fly wins throughout the world.

Looking back on this project, I've been trying to think if there are any improvements that could be made, but I can't think of any. It's such a simple and straightforward project that I should have started on the QuickSilver the day it arrived. An evening of enjoyable work and a few days of priming and painting are all that's required to convert your X-Cell into a real showpiece for either weekend flying or that next contest. Try it—you'll like it!

*Here's the address of the company featured in this article:

Miniature Aircraft USA, 2324 N. Orange Blossom Trail, Orlando, FL 32804.

NIFTY 50

(Continued from page 104)

Unfortunately, it isn't labeled or clearly identified anywhere in the plans or instructions, and I used the wrong sheeting. This was my mistake, and I had to re-cut the sheeting to fit where the piece I used was supposed to be.

I also had trouble with the wing-tip plates. These pieces are pre-cut, but I just couldn't get them to fit smoothly at the leading edge. I overcame this by using some scrap to fill the area behind the leading edge to make a smooth fit. After shaping and sanding the entire wing, the center-section reinforcement cloth was applied with Zap, which is just as strong as epoxy, but works faster (just watch out for the fumes!). Also omitted from the instructions was any mention of the need to add reinforcing tape, but this was shown on the plans.

The fuselage was next. Again, the parts came cut exactly to the correct size and shape. With only a few deviations, the fuselage is mostly constructed using the basic box concept, and the instructions adequately deal with this part of the construction. Because of the solid bulkheads, Nyrods are recommended for the rudder and elevator.

The instructions don't mention installation of the pushrods until all the bulk-

(Continued on page 135)

NIFTY 50

(Continued from page 132)

heads have been glued into place, but I think it would be easier to drill the holes in the bulkheads *before* gluing them between the two fuselage sides. I usually build a kit exactly according to the instructions when doing a review, because this allows the kit to be reviewed exactly as it was designed. However, I don't like to "build myself into a corner" if I can help it, so I cheated by drilling the holes before I installed the bulkheads. When drilling through balsa, it's helpful to use a piece of brass tube with the inside beveled slightly. Pick a piece of tube that's the same size as the required hole, chuck it into your drill, support the opposite side of the wood, and then drill. The hole will be clean, and you won't tear the wood. Another advantage of this method is that when drilling holes at an angle, e.g., those for the pushrod exits, the "tube drill" won't "walk" across the piece, but will make a clean, angled hole.

The front of the fuselage has several unique features: The "windshield block" is cut from a solid balsa block; the tank fits on a platform behind the engine with its rear fitting nicely into the cutout in the windshield block; the maple engine rails go back to the bulkhead at the front of the radio compartment, and under these rails are vertical, 1/8-inch balsa sheets that extend down to the bottom sheeting and dampen engine vibration. When the ply landing-gear mounts and the nose and "windshield" blocks have been installed, the fuse is sheeted cross-grain.

The stab and fin are of 3/16-inch balsa sheet; both are made of two pieces (a front piece and a rear piece) that have to be glued together. After mounting the fin, the fuselage top sheeting along the sides of the fin is installed with the grain running lengthwise. (This is the sheeting that I confused with the wing-tip sheeting; the taper was identical, but the grain wasn't.) All pieces are shaped, sanded and mounted on the fuselage. The elevator is made of two pieces with the right and left halves connected with a 3/16-inch hardwood dowel.

The two landing-gear wires must be soldered together. I'd never done this before, so it was a new experience for me. I don't know if I used the correct procedure, but it worked. First, using nylon landing-gear straps, I pre-mounted both wires to the fuselage. I cleaned, fluxed and tinned the wire, wrapped it with the thin wire provided, then added heat and solder. If I say so myself, the results were

good.

The tail "gear" is a steerable music-wire skid. As I've already said, I usually build kits as they've been designed, and on grass, this tail-gear arrangement would work out well—no tail wheel to "hook" the grass. Unfortunately, on asphalt, the skid will provide very little control. This can easily be corrected, however, by using a longer wire and bending it for the installation of a conventional tail wheel. The plans and instructions don't discuss any option for the tail skid, so I built it as designed, but I did make an adapter so that I can attach a tail wheel to the skid using a wheel collar.

After a thorough sanding, the entire plane was covered and trimmed using Black Baron Film from Coverite*. This was the first time I'd used this product, and I was very pleased with the way it handled.

For power, I used a Magnum GP .25. I've had this engine for several months and, so far, I've been very pleased with its performance. This relatively inexpensive engine holds a dependable idle, responds smoothly to the throttle and has very impressive power for its displacement.

For control, I installed a Tower* Gold Series 6-channel radio using three Royal* Titan servos. Of course, using only three channels for ease of flight, I connected the rudder to the right-hand stick. This puts my primary controls on the right stick, and it allows those who are unfamiliar with 3-channel planes to adapt easily. The 2 7/8 x 9 1/2-inch radio compartment was more than adequate.

The kit includes fuselage side doublers to support the servo rails, which are also supplied. To mount the servos, I simply cut a piece of 3/32-inch ply wide enough to fit the radio compartment and long enough to accommodate the servos and the switch. I then cut a hole in the middle for the three servos to fit with the mounting lugs along the sides. Using the scrap from the hole, I doubled the thickness of the sides to give the servo-mounting screws some wood to bite into. This ply servo holder was then mounted to the servo rails with four screws. The radio compartment has a sub-former that extends only approximately halfway up the sides of the fuselage and about 3 inches behind the front of the radio compartment. To install my receiver and battery securely, I cut a block of foam to fit the compartment and then cut a slit in the foam and slid the receiver and battery into the block. This provides a 1/2- to 3/4-inch

(Continued on page 136)

Hobby Lobby's NEW! CATALOG 14 is ready NOW!

**Catalog 14 is BIGGER than ever
with over 200 things
you have never seen before:**

NEW Giant Telemaster,
NEW High-performance Electric Motors
with NEW Props and accessories,
NEW Electric Airplanes and the
world's FASTEST electric plane,
NEW FAST boats,
NEW Steam boat,
NEW ORACOVER covering material,
NEW Helicopter,
NEW sailplanes, NEW accessories...



**Call us at (615) 373-1444
or send the order form.
FREE IN THE USA
Outside USA send \$2.00**

**Call for FIRST CLASS mail
\$2.00 — bill to your credit card.**

man

Name

Street Address

City

State

Zip

HOBBY LOBBY
INTERNATIONAL, INC.®

**5614 Franklin Pike Circle
Brentwood, TN 37027
(615) 373-1444**

MODEL AIRPLANE NEWS HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!

Directory space is sold on a yearly basis with a choice of three payment plans: 1. \$179 per year, payable in advance; 2. \$97 for six months, payable in advance; or 3. \$17.50 per month to be billed monthly. Space reservations must be received by the 20th of the third month preceding publication (for example, January 15th for the April issue).

CONNECTICUT—Bristol

15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two- and four-cycle engines. All major items discounted. Hours: Mon., Tue., Wed., 10-7; Thu., Fri., 10-8; Sat., 10-5:30; Sun. Nov.-Jan. 1-4.

BRISTOL HOBBY CENTER

641 Farmington Ave., Rte. 6 583-7273

CONNECTICUT—Norwalk

Connecticut's leading R/C shop, 15 years experience flying and selling radio control. Over 3,500 different items in stock. Custom ordering for hard-to-find parts.

AL'S R/C SUPPLIES

54 Chestnut Hill Rd. 846-9090

FLORIDA—Miami

R/C airplanes, cars, boats, and helicopters. Mon. thru Sat. 9-6.

ORANGE BLOSSOM HOBBIES

1975 NW 36th St. 633-2521

FLORIDA—Ft. Lauderdale

Ft. Lauderdale's largest discount full-line radio control hobby shop. Specializing in helicopters, Mon.-Fri., 9-7. Sat. and Sun., 10-5.

R.C. HOBBIES

6800 North University Dr. 305-721-7200

FLORIDA—Winter Springs

R/C Planes, Cars, Boats, Jets, Plastic Models. Radios, Engines, All Accessories. U.S. Distributor for Yellow Aircraft. Visit our Showroom. (35 min. from Disney World)

FIORINZE HOBBY CENTER, INC.

420 W. S.R. 434 (407) 327-6353

ILLINOIS—Chicago

Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon.-Fri. 10-9; Sat. 9-6; Sun. 11-4.

STANTON HOBBY SHOP, INC.

4734 Milwaukee Ave. 283-6446

NEW JERSEY—Mercerville

Complete line of planes, Robbe, Sig, Kraft, Great Planes. Large R/C selection plus trainers, boats, and all other hobby needs. Open 7 days.

IRON HORSE HOBBIES

116 Flock Rd. 586-2282

NEW JERSEY—Red Bank

Full-line hobby shop. Ask us, we will compete with mail-order prices. Mon.-Wed. 10-6, Thu. Fri. 10-8, Sat. 10-5, Sun 12-4.

HOBBYMASTERS

62 White St. 842-6020

OHIO—Findlay

Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories, and parts. We are authorized Sig and Dremel dealers. Also sell plastic kits and model rockets. Tue. & Thu. 3-9, Mon., Wed., Fri., & Sat. 10-9.

JINX MODEL SUPPLIES

721 Rockwell Ave. 422-5589

OKLAHOMA—Tulsa

R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC. Hours: Mon.-Sat. 10-6, Thurs. 10-8.

WINGS 'N THINGS HOBBY SUPPLY, INC.

5241 S. Peoria Ave. 745-0034

TEXAS—Houston

R/C airplane specialists, R/C cars, boats, helicopters. Plastic models, rockets, trains, HO & N. "Toys for Big Boys." Mon.-Fri. 11-7, Sat. 10-6.

LARRY'S HOBBIES

156-F FM 1960 E. 443-7373

LATIN AMERICA

COSTA RICA—San Jose

Complete line of R/C airplanes, cars, boats, and helicopters. Parts and professional expert service and advice. Julio Pastura, President. Weekdays 4-10 p.m.

EL HOBBY SHOP

Centro Commercial, San Jose 2000

Apartado 529, Centro Colon 32-26-81

Send sales message and payment to **Model Airplane News Hobby Shop Directory**, 251 Danbury Rd., Wilton, CT 06897.

For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Katherine Tolliver.

NIFTY 50

(Continued from page 135)

foam cushion that protects the radio from vibration.

The Nifty 50 balanced on the recommended CG without the addition of ballast. I don't know if this was the result of its design or just luck on my part. According to my handy-dandy spring scale, the Nifty's weight was exactly 3 pounds.

PERFORMANCE: After several weeks of waiting for the right weather (both for the aircraft and for the camera), I finally got together with Rich Uravitch for the first-flight assessment and photo session. The chosen day was partially cloudy with an approximately 15- to 20-knot wind, which wasn't ideal first-flight weather for a 3-pound aircraft, but deadlines prevail!

After engine start-up and a control-movement check, you know the rudder is "ruddering," the elevator is elevating and the throttle is throttling—and all in the correct direction.

Moment of truth: Aim it into the wind; deep breath; throttle up; on grass takeoff, a touch of up-elevator to keep the plane from nosing before the mains start to roll. This was what you'd call a surprising takeoff; the Nifty 50 was airborne and climbing in approximately 5 feet or less.

After minor in-flight trim adjustments, the Nifty 50 was just nifty to fly. With a little up-elevator and full right rudder, the Nifty 50 did *two*—count 'em—*two* nice rolls! Throttle back and the Nifty 50 is a docile little aircraft. The rest of the flight consisted of camera passes, and it ended with a slightly downwind dead-stick (it only carries 4 ounces of fuel). The Nifty 50 glided gently back and landed with about 2 inches of roll-out. Even in the stiff breeze, the Nifty 50 was well-mannered.

During subsequent flights, I've done a series of self-recovery exercises, i.e., putting the Nifty 50 into strange attitudes, throttling back and seeing if it would return to level flight. It did! (a trait expected of a trainer).

As I said at the beginning of this review, Mr. Florio doesn't claim that this aircraft is a trainer, but it can handle like one. During several more flights, I've found the Nifty 50 remarkably enjoyable to fly—capable of rolls, spins and loops. I've heard several comments like, "The way that thing handled, I could have sworn you had four channels." Most landings are so slow that the roll-out is less than 2 feet. On takeoff from asphalt, the tail will lift in approximately 2 feet, and the takeoff roll isn't usually more than 15

SUNSHINE HOBBY READY TO FLY!

Call: 1-800-45-TO FLY

*ACCESSORIES INCLUDED

| | |
|-------------------|----------|
| PIPER CHEROKEE-40 | \$129.99 |
| PIPER CHEROKEE-25 | 108.99 |
| FOKKER E111-40 | 119.99 |
| FANCY STICK-40 | 114.99 |
| FANCY STICK-25 | 69.99 |
| CESSNA 172-20 | 108.99 |
| CONDOR-40L | 119.99 |
| TERCEL-45 | 121.99 |

(ENGINE NOT INCLUDED)

| | |
|-----------------|---------|
| PIONEER I (CAR) | \$60.00 |
|-----------------|---------|

(ENGINE INCLUDED)

17221 South Western Avenue
Gardena, California 90247

CONTACT US FOR THIS MONTH'S SPECIAL



"Matched Performance System" for TOP PERFORMANCE

K&B ENGINES

| Airplane | Marine |
|-----------------------|-----------------------------|
| K&B FUELS 9 Blends | K&B GLOW PLUGS 4 Choices |

"Matched Finish System" for BEST APPEARANCE

| | |
|-----------------------|---------------------------|
| K&B FIBERGLASS CLOTH | K&B Micro-Balloons FILLER |
| K&B SUPER POXY RESIN | K&B SUPER POXY THINNER |
| K&B SUPER POXY PRIMER | K&B SUPER POXY PAINT |
| K&B MIXING CUPS | |



K&B MANUFACTURING

12152 Woodruff Avenue
Downey, California 90241

feet when I don't try to climb out too fast. Stalls are gentle; the Nifty 50 just drops its nose and recovers quickly. As shown by the easy landings, slow flight is remarkable.

This is one *nifty* aircraft! Apart from the too-brief construction instructions, the Nifty 50 builds easily, and the parts fit extremely well. It has a clean look and it's a lot of fun to fly—and isn't that what it's all about?

**Here are the addresses of the companies mentioned in this article:*

Florio Flyer Corp., 837 Johnsonburg Rd., St. Mary's, PA 15857.

Zap; distributed by Pacer Technology & Research, 1600 Dell Ave., Campbell, CA 95008.

Coverite, 420 Babylon Rd., Horsham, PA 19044.
Tower Hobbies, P.O. Box 778, 1608 Interstate Dr., Champaign, IL 61820.

Royal Electronics, 790 W. Tennessee Ave., Denver, CO 80223.

GOLDEN AGE

(Continued from page 118)

and was reported to have entered a series of stalls that ended in a crash. Undaunted, they decided to see if elevator control would help. They didn't know that with rudder only, the model's own stability was the answer; elevator control won't cure an inherently unstable model. Imagine the frenzied button-pushing that took place to control the elevator!

The Mulligan was repaired many times and tested repeatedly. The R/C equipment held up under all these tests, and it was shown that the radio system did work under actual flying conditions. Although later on, some respectable flights were made with various aircraft, not one landing was made without some sort of damage. They concluded that the push buttons had to be replaced and that the complex actions needed in some portions of the flight envelope (e.g., landing) were much too difficult.

Remote-control research was also under way at the U.S. Army Laboratories and, after consulting the people there, Purdue thought the answer to the control problem might be a ground-based duplicate of full-scale controls. One photo shows an arrangement that includes a seat, a control wheel and a rudder bar in full scale. A model with operating control surfaces was mounted in front of the pilot seat. The pilot was supposed to anticipate the actions of the flying craft, operate the controls accordingly, and then check the model to see if he actually moved the proper control! While information on this system is vague, it appears that the ground-unit controls operated escapement mecha-

SAVE YOUR FIELD!

The "SNUF-LER" muffler is a low cost, easy to install, lightweight, sound reducing muffler with no performance penalty. It is the answer to AMA muffler rule suggestions and saving flying fields.

- Meets AMA muffler rule suggestions.
- 3 to 10 decibels quieter than stock muffler.
- No power loss with possible 300-500 RPM increase.
- Improves engine idle — gives better fuel economy.
- Easily attached to most .25-1.08 stock mufflers.
- Heat and corrosion resistant Black "E" coat finish.
- No special adapters required.
- Weighs 3.5 ozs.

Fits: ASP, BRAT, ENYA, FOX, HP, IRVINE, K & B, MAGNUM, O.S. MAX, ROYAL, YS and SUPER TIGRE mufflers.

If not available at your hobby shop, ORDER DIRECT for immediate shipment. Check, M.O., Visa, M.C., or C.O.D. accepted. Add \$2.50 for UPS; \$2.00 for C.O.D. and 6% sales tax for Calif. resident.

SEND 25¢ or STAMP FOR ADDITIONAL INFO AND JTEC CATALOG

JTEC

164 School St., Daly City, CA 94014
(415) 756-3400



"SNUF-LER" MUFFLER
Patented

\$24.95
CAT. NO. 800

Meets
(IAC),
(IMAC)
Specs.

PT-26 or PT-19

Fully Aerobatic - FAI Pattern
Very Stable
List Price \$229. your price

60 Size - Span 68" Length 53"
\$139

Send check
or money order
Add \$7.00 shipping
Tx. residents add 7% tax

Span 84" Length 66" Area 1300", Engine 4-cycle 120-300
2-cycle Zenoah G-23 G-38, Sachs-Dolmar 2.4,
Super Tiger 2500-3000, Foam Wings
& Turtle Deck, Molded Cowling,
Canopy & Wing Tips



R & K MODELS
1402 Woodridge Cr.
Euless, Texas 76040
(817) 268-4817

nisms duplicating what was in the model. Therefore, the ground-based unit would duplicate the sequence that the airborne system needed for each desired operation!

The ground-based system showed much promise, but it was never actually used. Imagine adding all this to the complexity of their basic broadcast station! A few years ago, someone developed a cockpit-style control center that used a modern transmitter and control levers. While this one did work, the results were mediocre at best, and it took an accomplished R/C pilot to operate it safely.

Strangely, the Purdue XP-1 1/4-scale model was completed before the J-3, which was supposed to be the trainer that provided the basic performance information. As a model, the XP-1 became the XP-1/4, and a complete description seems unnecessary, considering the good photos. It used the typical stick-and-tissue structure of that day and was built by three students: Messrs. Brown, Marshall and Crosby. Mr. DeBey built the original R/C system, and he later built a more complex system with the help of Professors Wood and Harding of the Purdue Research Foundation.

Two Brown Jr. engines, mounted horizontally to duplicate the concept's flat engine cowls, provided ample power for

the 15-pound model. Both engines were fed from one 3-ounce tank! After initial tests, the engines were equipped with centrifugal electronic switches to cut the second engine if the first one quit. They were learning fast! Most remarkable was the inclusion of a fully retractable tricycle gear—perhaps the first in R/C.

From the photos, it's apparent that the giant-scale XP-1/4 was a most ambitious project. The development of such a plane and the creation of a multi-control R/C system for it was quite a feat in those days.

The XP-1/4 was first flown without the complex R/C system. The results were inconclusive, and further flights were postponed until the sophisticated system was ready. Flights were resumed several months later, but details about them are sketchy. On one flight, an engine quit, and this resulted in an uncontrollable spiral dive from several hundred feet. This led to the installation of the centrifugal switches, and this indicates that flight time was accumulated.

There were also some problems with takeoff, and these were corrected by a shift in the CG. Considering the magnitude of the XP-1/4 project, it's too bad that detailed flight reports weren't made. They

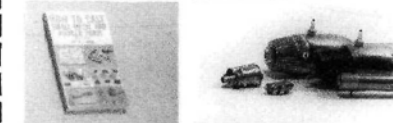
(Continued on page 138)

ADVERTISER INDEX

| | |
|------------------------------------|------------|
| A.H. Designs | 110 |
| Ace R/C | 131 |
| Airtronics, Inc. | 4 |
| America's Hobby Center | 11 |
| Aristo-Craft | 16-17 |
| Associated Electrics | 37 |
| Basics of R/C Cars | 130 |
| Bonded Model Products | 109 |
| Bridi Aircraft Designs, Inc. | 36 |
| Byron Originals, Inc. | 72 |
| Carl Goldberg Models, Inc. | 105 |
| Classified Directory | 126 |
| Composite Aircraft Engine & Supply | 138 |
| Coverite | 60 |
| Cox Hobbies | 40 |
| Dave Brown Products | 112 |
| Doylejet | 138 |
| Dremel | 9 |
| Du-Bro Products | 29 |
| Duracraft | 98 |
| Four M | 70 |
| Fox Manufacturing | 49 |
| Frank Tiano Enterprises | 129 |
| Futaba Industries | C3 |
| G.M. Precision Products, Inc. | 94 |
| Global Hobby Distributors | 34 |
| Gorham Model Products | 93 |
| Hawaii Precision Products | 129 |
| Historic Aviation | 25 |
| Hobby Lobby Int'l | 134, 135 |
| Hobby Shack | 10 |
| Hobby Shop Directory | 136 |
| Imitari | 122 |
| InVenture | 98 |
| J'Tec | 137 |
| K&B Manufacturing, Inc. | 136 |
| K&S Engineering | 119 |
| Kress Jets, Inc. | 122 |
| Kyosho | 61 |
| M.A.N. 400 Great Modeling Tips | 95 |
| M.A.N. Aero Picnic | 7 |
| M.A.N. Annual | 18 |
| M.A.N. Back Issues | 124-125 |
| M.A.N. Books | 30-31 |
| M.A.N. Helicopter Book | 74 |
| M.A.N. Plans | 120-121 |
| M.A.N. Posters | 133 |
| M.A.N. Subscription | 19 |
| M.G.A. | 119 |
| McDaniel | 110 |
| Midwest Products, Inc. | 3 |
| Miniature Aircraft USA | 78 |
| Model Products | 88 |
| Model Rectifier Corporation | C2, 39, 55 |
| Model Retailer | 60 |
| Northwest Hobby Supply | 106, 109 |
| O.S. Engines | C4 |
| Packard & Assoc. | 70 |
| Problem Ad | 138 |
| QSAA Fly-In | 8 |
| R&K Models | 137 |
| R.C.B.M. Subscription | 99 |
| R.C.C.A. Subscription | 127 |
| Repla Tech International | 138 |
| Retailer Ad | 113 |
| Robart Manufacturing | 70 |
| Robbe Model Sport | 132 |
| Royal Products | 15 |
| Sig Manufacturing | 58-59 |
| Slimline Mfg. | 98 |
| Southeast Model | 122 |
| Sunshine Products, Inc. | 136 |
| Tatone, Inc. | 110 |
| Technopower II, Inc. | 109 |
| Teleflite Corporation | 122 |
| Tidewater Hobby Enterprises | 123 |
| Top Flite Models, Inc. | 12 |
| Top Quality Hobby | 113 |
| Tower Hobbies | 79 |
| Trojan Horse Hobbies | 128 |
| Turbine Technologies | 128 |
| Vailly Aviation | 119 |
| Video Specialties | 138 |
| Watkins Aviation, Inc. | 138 |
| Williams Brothers, Inc. | 94 |
| Windsor Prop | 123 |
| Zenith Aviation | 13 |

JET ENGINES

AND TECHNOLOGY



BLUE BOOK #10
Small jet engines catalog. Engines, U.S. FOR.
SPEC' sheets, plans, supplies. 25pp....\$5.00 \$5.00

THE COMPLETE BOOK OF HOME WELDING
John Todd, 496 pp., 464 illus.....\$19.60 \$29.95

THE HOME MACHINIST'S HANDBOOK
Doug Briner, 288 pp., 278 illus.....\$16.60 \$23.95

HOW TO CAST SMALL METAL AND RUBBER PARTS
William Cannon, 176 pp., 142 illus.....\$9.70 \$13.95

JETS
Jet builder's monthly newsletter.
Engineering, construction, shows.....\$12/YR \$15/YR

DOYLEJET

P.O. BOX 60311-A, HOUSTON, TEXAS 77205
(713) 440-4744

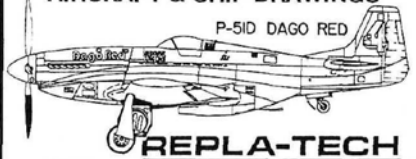
★ SCALE ★ DOCUMENTATION

DRAWINGS-PLANS-PHOTOS-BOOKS

WE'RE THE LARGEST!

SCALE-TECH

AIRCRAFT & SHIP DRAWINGS



1989
AIRCRAFT
CATALOG
\$2.50

INTERNATIONAL DEPT. 20
48500 MCKENZIE HWY.
VIDA, OREGON 97488
TEL: (503) 822-3280

GOLDEN AGE

(Continued from page 137)

sure would have made for some fine reading today!

Next time, I'll conclude this series with a report on the 1/4-scale Cub and some amazing servo development.

Finally, the Vintage R/C Society now has a substantial number of members, and the president and newsletter editor are well-known. Watch for the newsletter! ■

• PROBLEM: Model Airplane News

sold out at your newsstand?

• SOLUTION:
End the search.
Call 1-800-435-0715
for home delivery.

COMPOSITE AIRCRAFT ENGINEERING

AND SUPPLY P.O. BOX 866, LAPEER, MI 48446

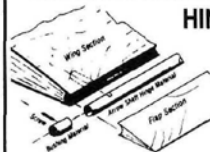
VACUUM BAG SYSTEM FOR WING CONSTRUCTION

SUCKER-KIT™.....\$59.95

VACUUM BAG
LAY UP VIDEO.....\$39.95



GAPLESS ARROW SHAFT HINGE KITS



Kit Includes
(2) Tubes,
Bushings &
Screws

(3) SIZES .013 Wall Thickness

7/32 OD X 26".....\$11.95

9/32 OD X 30".....\$11.95

11/32 OD X 33".....\$11.95

PHONE
(313) 664-3330

Or
Send \$1.00 & SASE
For Product List
And Samples Of
Real Wood Veneer
Skins.

Dealer Inquiries
Welcome

NEED THE REAL THING?

U.S. MILITARY & CIVILIAN

FLIGHT CLOTHING

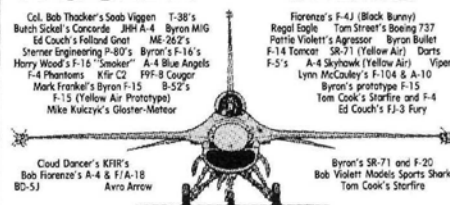
- EMBLEMS & INSIGNIA
- JACKETS
- FLYING SUITS
- HELMETS
- PARACHUTES
- LEATHER JACKETS
- FULL LINE OF NOMEX APPAREL
- COMMUNICATIONS
- SURVIVAL GEAR
- ACCESSORIES
- GLOVES
- G-SUITS

ALL NEW MANUFACTURE
CURRENT MILITARY ISSUE

WATKINS AVIATION, INC.
15770 MIDWAY RD. HANGAR #6
ADDISON, TX 75244
214/934-0033

FREE ILLUSTRATED CATALOG
To U.S. Zip Codes

DUCTED FANS



Cloud Dancer's KFR's
Bob Florence's A-4 & F-16
BC-5J

Avro Arrow

Byron's SR-71 and F-20
Bob Violett Models Sports Shark
Tom Cook's Starline

VHS-BETA

TAPE 1 • AN INTRODUCTION TO DUCTED FANS
W/COMMENTARY BY RICH URAVITCH, M.A.N.

TAPE 2 • FASTEST FANS IN THE WEST

TAPE 3 • CANADIAN DUCTED FANS

\$29.95 Ea.—Check, MO, Visa or MC
Video Specialties, Inc.

P. O. Box 4557, Monroe, LA 71211-4557
\$3.50 Shipping & Handling—(318) 322-8844